ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5. 1910.

XX.—NOTES ON THE BOTANICAL RESOURCES OF YOLA PROVINCE, NORTHERN NIGERIA.

J. M. Dalziel.

The following Report on the Flora and Economic Resources of Yola Province, Northern Nigeria, by Dr. J. M. Dalziel, has been sent to the Director by the Secretary to the Administration, Northern Nigeria. The report was accompanied by a large collection of plants representative of the vegetation of Yola Province. Three new species, *Cussonia nigerica*, Hutchinson, *Boswellia Dalzielii*, Hutchinson, and *Boswellia odorata*, Hutchinson, have been found in the collection and the descriptions are inserted in the Report. Some additional determinations of the plants referred to have also been added. It seems probable that the *Sansevieria* referred to on p. 139 is not *S. guineensis*, as this species is confined to a small area in the neighbourhood of Sierra Leone.

The province of Yola is the most easterly of the Benue provinces, and on the east and south borders on German Kamerun, while the 11th parallel of latitude nearly corresponds with the Yola-Bornu boundary on the north. The general geographical features are those of mountain ranges separated either by the bush savannah typical of the greater part of Northern Nigeria, or in much greater extent by low-lying plains and meadows, which become swamps during the rains.

A great variety of pagan tribes inhabit the various hill ranges, while the level tracts are rather sparsely populated by the somewhat degenerate and perhaps impure race of Adamawa Fulani, living for the most part in little scattered farm-villages, which in the more fertile districts become grouped in communities covering sometimes several square miles, and more rarely in unwalled towns, while the cattle breeding "borroro" maintain the traditions of the race by forming no permanent settlements but choosing their pastures with more or less regularity with the changing seasons.

(16417—6a.) Wt. 92—428. 1375. 6/10. D & S.

To the botanist the stretches of wooded bush and flat plain offer perhaps little that is not to be found in other riverine or landward provinces of Central Nigeria, but the absence of Hausa names for several trees and plants well known to the local Fulani suggests that the collection of plants prepared in this province may contain at least a few species not yet known to exist farther west or north.

As one travels southwards from Bornu towards the Benue an obvious difference in the arborescent vegetation of the bush presents itself, the preponderance of thorny acacias in the more northerly district giving place to broad-leaved trees in increasing degree within Yola Province. Gum acacias are still abundant, however, and the larger species continue to be conspicuous trees both north and south of the river, across the Anglo-German boundary, and into Muri Province on the west.

From a commercial point of view there are at present only two vegetable products which are important and valuable enough for export, viz., Gum and Shea Kernels (*Butyrospermum Parkii*, Hausa, "Kedanya," Fufulde, "Karehi"), which after collection by Fulani and pagans alike, or bartered from the latter, are brought in considerable quantities to the trading companies' stores. These are, however, less a product of native industry than an evidence of their natural abundance, and the facility with which they can be procured and fetch a market price with a minimum of labour. The Niger Company's store at Yola alone received over 400 tons of butter-nut kernels during the months of August and September, 1909, to which should be added the quantity which arrives at the German firm, while, in addition, the store of the former company at Nafada on the Gongola naturally exploits the resources of Yola Province as well as of Bauchi and parts of Bornu.

Gum, which is the predominating forest product of Bornu and of the northern Hausa provinces, is also an important asset on the upper Bornu and its tributaries. I have made frequent enquiries to find if possible exactly which species of tree yields each variety of gum sold to the European firms. Unfortunately for such an attempt the leather bag or calabash of a native gum collector in the bush generally contains pieces differing in colour and appearance, which have been dislodged by means of a long stick or spear from any species of gum-yielding tree abounding in his district, and any sample may thus contain the products of several species. The culture of gum as carried out in Kordofan and Sudan is entirely unknown in Nigeria, the collection being done at random at any time and in the most desultory fashion. Three varieties are recognised and accepted by the Niger Company under the following names:—"Falli," "Marrua" and "Mumuye." These are originally place or district names, and are not referable in any definite degree to gums of any single species of acacia or other genus. Falli is a place name in the Gongola district, and the gum which arrives at the Niger Company's store at Nafada is chiefly of this variety. Thus, out of 1,500 cases received there this year, 1,300 were "Falli." In Yola, on the other hand, most of the gum received is "Mumuye," with a certain amount of "Marrua" and less "Falli." Marrua is a district in German Adamawa, and Mumuye is the name of a pagan tribe near the Anglo-German

boundary in Muri Province, but it must be said that samples of gum bearing these names are not necessarily gathered in these districts, which have in the course of trade operations afforded designations for different varieties of the article.

In general, any white or nearly colourless gum is called "Falli"; the tinted varieties, yellow or reddish, are classed as "Marrua," while "Mumuye" gum is usually in lumps or masses of a dark smoky colour. "Falli" and "Marrua" gums are in the form of large tears or pear-shaped pieces, lumps, broken fragments and occasionally pencils. Both are clear on fracture, but the surface of a piece of "Falli" gum usually becomes finely fissured, with a loss of transparency, while "Marrua" gum as a rule retains a glassy surface.

As to the botanical sources of each of these varieties, one might suspect that "Falli" gum is largely the product of *Acacia Senegal*, and this is doubtless true in part at least. This grey-barked acacia, the "hashab" of Kordofan, is abundant enough in the northern provinces, though even there it is rarely more than a shrub or small tree. Its Hausa name is "dakwora" (Fufulde, "dibehi"), its gum is often almost colourless, and is a known forest product exported from Bornu and the north as "kolkol" gum, and it may possibly be the chief species supplying the "Falli" gum to Nafada. In Yola Province, however, *Acacia Senegal* is much less abundant than in the north, and is usually an inconspicuous shrub, while the tree which the natives point to as the chief source of "Falli" gum is the "fara-kaya" (Hausa, "white-thorn"), more rarely called "bauji" in Hausa, and "alluki" in Fufulde. This is a large acacia with a spreading crown of dark foliage, pale scurfy bark, long white thorns and balls of white flowers. It is probably *Acacia albida*. Another species of acacia called "karkara" in Hausa (Fufulde "fitarlahi"), apparently also known in Hausa as "kumban shafu," or "parshin shafu," also supplies gum which ranks as "Falli." This is a tall tree with light coloured bark, spikes of white flowers, and branches armed with stout thorns. It is abundant in the north, and also on the Bornu road from Yola to Song, and is so far peculiar in habitat that one frequently finds it in small areas forming little groves by itself to the exclusion of most other species. The gum appears to be of a particularly agreeable quality, as native carriers may often be seen sucking either the gum or pieces of the bark along with "kanwa" or Bornu salt as a pleasurable diversion.

"Marrua" again appears to be properly the product of a single species which I have little doubt is *Acacia Senegal*, or the "Falli" of the Sudan. This, which is known in Hausa as "dussa," and in Fufulde as "bulbe" or "fulbe," is a shrub or small tree with yellow balls of flowers, narrow, curved and almost moniliform pods, and with the characteristic yellow or ochrey powder on the bark. It is common enough in Yola Province, as well as in the German colony, but it is not to be compared in abundance with some districts in the north, where the so-called "mimosa bush" is in places largely composed of this species alone. Doubtless also gum from the "gabbarua" (Fufulde "gabde"), *Acacia arabica*, and other species, and occasionally the less soluble gums from one or two species of

Albizzia, which are nearly as common in the province as the acacia, may at times be mixed with samples of the better varieties.

"Mumuye" gum on the other hand is derived from one or more species of *Combretum*, the usual source being a tree called in Hausa *"wiyan-demmu" or "chiriri." The "taramnia" or "taraunia" (Fufulde "buski"), *Combretum verticillatum*, and probably other species of *Combretum*, *e.g.*, the tree known as "zindi" (? Hausa or Kanuri name), also supply this variety. Another of the *Combretaceae*, *Anogeissus leiocarpa* (Hausa, "marike," Fufulde, "kojoli"), a tree with light graceful foliage and balls of pale flowers, yields a gum some of which is probably sent as "Mumuye," and the well-known *Sterculia tomentosa* (Hausa, "kukuki," Fufulde, "bobori"), yielding a sort of gum tragacanth, may also in some cases be similarly classed. The various species of the *Combretaceae* mentioned are all particularly abundant throughout Yola Province, and gum classed as "Mumuye" is obtained quite as much from Kombo and Shillem on the river Gongola and elsewhere as from districts south of the Benue.

Gum finds its application in many simple ways in native arts, *e.g.*, "finishing" dyed cloth, preparation of Mallam's ink, compounding of sweatmeats and other market comestibles, &c.

Two other species yield gum which so far as I am aware is not collected by the natives in this Province. One of these is the peculiar tree called "Takanda giwa" (Elephant's sugar-cane), *Cussonia nigerica*, the leaves of which drop off during the dry season, giving the bare branches, with their somewhat umbellate arrangement, the suggestive appearance expressed by its other designation of "Hanun Kuturu" or "Leper's hand." This exudes at wounded points a very clear colourless gum which hangs in slender pencils and appears to have some slightly irritant quality, as the tongue tingles a little when it is sucked.

This plant proves to be a new species the diagnosis of which is as follows :—

Cussonia (Eucussonia) nigerica, *Hutchinson*, sp. nov. ; affinis *C. Kirkii*, Seem. et *C. djalonensi*, A. Chev., ab illa foliis repando-dentatis et bracteis reflexis glabris, ab hac inflorescentiis elongatis simplicibus bracteis acuminatis glabris differt.

Arbor cortice corrugato, ramis subumbellatis dispositis (fide *Dalziel*). *Folia* ad apices ramorum conferta, longe petiolata, digitatim 6-foliolata ; petioli 10–30 cm. longi, graciles, subtiliter sulcati, glabri ; foliola sessilia, oblanceolata vel elliptico-lanceolata, ad basem longe et sensim attenuata, longe caudato-acuminata, acutissima, 7–14 cm. longa, 2–5 cm. lata, remote repando-dentata, parte infima cuneata integra excepta, dentibus rotundatis, tenuiter chartacea, glabra, subtus pallida, arcte reticulato-venosa, nervis lateralibus utrinque 11–15 arcuatis supra vix subtus leviter elevatis ; stipulae intrapetiolares cum petiolo basi adnatae, ovatae, acuminatae, circiter 1 cm. longae, ciliatae. *Inflorescentiae* spicatae, ad apices ramorum confertae ; spicae elongatae, circiter 30 cm. longae ; axis basi 5 mm. diametro, subteres, ad apicem sensim attenuata ;

* Meaning "neck of demmu," the latter being *Varamus exanthematicus*, a large species of lizard, from the characteristic fissuring of the bark.

bracteae triangulari-ovatae, acute acuminatae, 3 mm. longae, demum reflexae, glabrae. *Flores* non visi. *Fructus* ellipsoidei, leviter 4-costati, 8-mm. longi, 5 mm. diametro, exocarpio tenui fusco, pyrenis crustaceis extus spongiosis intus nitidis.

Tropical Africa. Northern Nigeria: Yola Province; Kilba, *Dalziel* (coll. 1909), 172.—Hausa name, "Takanda giwa."

The other species is a tree which I have not observed in the Hausa States, and for which I have never been able to ascertain a Hausa name. It is called in Fufulde "Tursuje," and is a tree of about 15 to 20 ft. at most, with pinnate leaves and pendulous racemes of plum-like, edible, acid fruit, turning red, purple or nearly black when ripe. It may possibly prove to be a species of *Odina*, as a piece of gum which I found on an injured tree was clear and nearly colourless but readily became brittle and friable when dried. The bark of this tree is said to be used by the Fulani in Nassarawa as a remedy for sleeping sickness.

The blood-red resin of *Pterocarpus erinaceus* (Hausa "Madobia," Fufulde, "Yinyamhi," or possessor of blood), is less esteemed by the natives than might be expected in a province where the species is particularly abundant. This tree, apart from its occasional use medicinally or perhaps like gum in glazing fabrics, and another species, *Pterocarpus lucens*, which I have not seen in other provinces, are chiefly valued for their excellent timber.

Daniella thurifera (Hausa, "Maje" and "Kadaura," Fufulde "Karlahi"), the usual source of West African copal, a tree which grows to a much greater size in the western and central parts of the Protectorate, such as Kontagora and Zaria, is not now tapped for its balsam for purposes of trade. This product is used as frankincense either alone or in combination with other resins to fumigate and impart an agreeable scent to clothing and to improve the atmosphere in the houses of the better classes during the rains. Thus "Karon Maje" (W. Afr. Copaiba balsam), along with the odorous resin of two new species of *Boswellia*, *B. Dalzielii* (Hausa, "Hararabi" or "Ararabi"), and *B. odorata* (Hausa, "Hanu"; Fufulde, "Andakehi"), and the very fragrant tuberous root of the rush "Kajiji" (*Juncus* sp.) abundantly cultivated in Bornu, are burnt while the wearer holds his garments open over the fumes. The shrub known as "Dashi" (Fufulde, "Badadek") has a similar use, but in this case the whole bark is powdered and burnt. The above mentioned species of *Boswellia*, though well known all over N. Nigeria, are exceedingly abundant in Yola Province, and are frequently planted as a fence and support to the Zana matting enclosing the compounds in native towns.

These two new species may be described as follows:—

Boswellia Dalzielii, *Hutchinson*, sp. nov.; ab omnibus speciebus adhuc descriptis foliis glabris argute serratis inflorescentiis elongato-racemosis valde distincta.

Arbor foliis post anthesin evolutis (fide *Dalziel*); ramuli crassi ad apices circiter 1 cm. diametro, cortice tenui deciduo. *Folia* imparipinnata, saepe 8-juga, glabra; rhachis 30 cm. longa, subteres, leviter sulcata, circiter 1·5 mm. diametro; foliola plerumque opposita, infima ovato-lanceolata, parva, intermedia et superiora elongato-lanceolata, apice sensim longe acuminata, basi cuneata,

inaequalia, 5–9 cm. longa, 1–2 cm. lata, membranacea, utrinque subnitida, grosse et argute serrata, serris circiter 3 mm. distantibus, nervis lateralibus utrinque 18–20 patulis vix prominulis. *Racemi* terminales, conferti, multiflori; pedunculus communis 15–25 cm. longus, glaber vel basin versus parce puberulus; pedicelli subfasciculati, patuli, graciles, 0·7–1·2 cm. longi, glabri; bracteae minutae. *Calycis segmenta* 5, ovato-triangularia, obtusa, 1 mm. longa, 1·25 mm. lata, subcoriacea, nisi margine puberulo glabra. *Petala* 5, leviter oblique elliptica vel oblongo-elliptica, apice obtusa et inflexa, 5 mm. longa, 3 mm. lata, venosa, margine minute glanduloso-puberula. *Stamina* 10; filamenta basi disci inserta, alterna brevioria, 2–2·5 mm. longa, basin versus sensim incrassata, glabra; antherae oblongae, 2 mm. longae. *Discus* annularis, crassus, undulate lobatus, minute puberulus. *Ovarium* 3-loculare, ovoideum, leviter trilobatum, 1·25 mm. diametro, glabrum; styli 3, connati, 1·5 mm. longi, glabri. *Fructus* clavatus, basi attenuatus, 2 cm. longus, superne 0·8 cm. diametro. *Semina* non visa.

Tropical Africa. Northern Nigeria: Kontagora, *Dalziel* (coll. 1906), 279 (flowering specimen); Katagum District, *Dalziel* (coll. 1908), 340 (fruiting specimen).—"Ararabi" or "Hararabi" of the Hausa tribe.

Boswellia odorata, *Hutchinson*, sp. nov.; affinis *B. papyriferae*, Hochst. et *B. Dalzielii*, Hutchinson, ab illa foliolis serratis longe acuminatis glabris, ab hac inflorescentiis paniculatis dense pilosis differt.

Arbor; ramuli crassi, cortice pallide fusco deciduo glabro. *Folia* imparipinnata, 6–9-juga; rhachis 30–40 cm. longa, subteres, sulcata, parcissime pilosa, 1·5–3 mm. diametro; foliola plerumque subalterna vel superioria opposita, infima lanceolata, minora, intermedia et superiora elongato- vel lineari-lanceolata, apice sensim longe acuminata, basi cuneata vel subrotundata, 5–10 cm. longa, 1–2 cm. lata, membranacea, serrata, serris circiter 4 mm. distantibus, nervis lateralibus utrinque circiter 12 patulis vix prominulis. *Paniculae* terminales, confertae, 20–30 cm. longae, dense pilosae; rami laterales racemosi, usque ad 14 cm. longi; pedicelli 5–8 mm. longi, patuli, demum subreflexi, canaliculati, pilosi; bracteae minutae, dense pilosae. *Flores* eis *B. Dalzielii* simillimi.

Tropical Africa. Northern Nigeria: Yola Province; commonly planted in towns, *Dalziel* (coll. 1909), 167.—Hausa name, "Hanu"; Fufulde, "Andakehi."

[A species of *Boswellia* (*B. chariensis*, Guillaumin) has recently been described as new, from specimens collected by Chevalier in Central Chari and Bagirmi; it seems, however, hardly distinguishable from *B. papyrifera*, Hochst.—J. H.]

Besides its application as a scent, the resin of these trees is used like gum along with the bark of the Verbenaceous tree "Denya" (Fufulde, "Galbiji") *Vitex Cienkowskii*, in compounding Mallam's ink and the tree is also apparently regarded as one of the many antidotes to arrow poison. Thus a decoction of the root, along with that of *Daniella thurifera*, is used in other provinces, but in Adamawa I have known the Fulani in emergency simply to chew

the fresh bark, and if vomiting takes place after a few hours, followed by recovery, the happy issue is attributed to this remedy in which they appear to place considerable confidence.

The only other forest product worthy of mention is rubber obtained from *Landolphia owariensss*, some of which finds its way in biscuit form to the Niger Company at Yola, but which is practically entirely a product of German Adamawa.

Arrow-poison here, as universally throughout N. Nigeria, is prepared from the seeds of *Strophanthus* (*S. hispidus* and *S. sarmentosus*, "kwankwanni" Fufulde, "Toke") as the sole indispensable ingredient, all other added substances vary in different localities, and no single one of them is essential. Even the "bijaje" mentioned by Barth in 1852 as the reputed arrow-poison of the Fumbina or people of Adamawa is only a secondary ingredient added to that obtained from *Strophanthus*. This "bijaje" I find is a species of *Ficus*, a tree with shining cordate acuminate leaves, and pale drooping branches like a "weeping ash," forming a picturesque object on the black granite borders of the Kilba and Marghi pagan hills in the northern part of the province. The splendid shade tree *Kigelia africana* (Hausa "Rahaina" and "Nonon giwa" *i.e.* "Elephant's breasts"; Fufulde, "Jirlahi"; Kanuri, "belongu"), with its huge pendulous cucumber-like fruits, becomes conspicuous on the Upper Benue and in the eastern provinces, while in parts of Bornu and north of Lake Chad it is said to replace the "Kuka."

In regard to fibre plants, Yola Province probably offers nothing new. A species of *Sansevieria* (Hausa, "Moda"; Fufulde, "Bessekoje"), one of the bowstring hemps, thrives well in a natural state in shady places throughout the province, and in the most northerly districts of the Protectorate, many hundred miles from the sea, and although its fibre is used, the plant is never cultivated. The tall *Hibiscus lunariifolius* (Hausa, "ramma," Fufulde, "gabbei") appears to be the only species cultivated definitely for fibre. The widely distributed and variable *Urena lobata* (sometimes called by the Hausa, "ka fi rama," *i.e.*, you surpass "ramma") is made use of, as also in emergency any of the taller species of Malvaceae, *e.g.*, "ramma kurumi" (*Wissadula rostrata*). Several wild species of *Hibiscus* with tall straight stems are stripped, and their bark is used as cordage, though the "kargo" (Fufulde, "berkeje") *Bauhinia reticulata*, perhaps the most abundant shrub in the Northern Nigerian bush, is the most commonly available for this purpose.

Securidaca longepedunculata (Hausa, "sainyia" and "uwar magunguna"; Fufulde, "alehi") is a common shrub in most parts of Northern Nigeria, but I have never known it to be used as fibre like the Buaze fibre from the same plant in Nyasaland. The second Hausa name means "mother of medicines," yet, although the root especially has many medicinal and more magical uses, it is difficult to find any really important application.

In Angola it forms one of the ingredients in an ordeal brew, and in this country there is a general belief amongst white men that it is a usual source of arrow poison; but I have only rarely found it to be so used even where the plant is plentiful, and then only as one amongst many additions to the essential *Strophanthus*.

In cultivation the Adamawa Fulani appears to be exceedingly indolent. Guinea corn is the staple cereal as compared with the millet of Bornu.

A serious epidemic affected this crop on the Gongola and Upper Benue in 1904, and was probably due to the same aphis as that found in the Sudan. One may not infrequently find certain fields where the leaves of guinea corn are covered with aphides and the characteristic sticky deposit, but this season I have also always found several varieties of their natural enemies, the lady birds, on the same plants. The sorghum bug (*Zygaeus militaris*, Fabr.) is also not uncommon, but is found on many other plants, particularly *Calotropis procera* ("tumfafia," Fufulde, "bamambeh"). Industrious Hausa or Fulani from other provinces facetiously remark that "rogo" or Cassava (Fufulde, "Mbai") is the chief crop of Adamawa because it is easy to grow, and there is some truth in the gibe. Wheat is rarely seen, but a fair amount of maize and rice is grown, although the latter grass does not grow wild in the South as in Bornu and Katagum, where it is sometimes gathered by the simple method of sweeping a calabash over the ripening grain. It cannot be denied that the cultivation of rice is greatly neglected in this province, where vast meadows remain moist throughout the year, and, at a low estimate, over half of its area is actually under water for several weeks between July and September. The extensive marsh between the Benue and the long ridge on which Yola town is situated, some two miles in width and many miles in length, is alone capable of supplying the province with this grain, a fact which was pointed out to the late Emir and his Chiefs by a party of Turkish exiles last year. From the deck of a river steamer, when the Benue is in flood, one cannot fail to see extending from the edge of the natural channel almost endless areas of grassy swamps, little cumbered by trees, and limited only by the range of hills some 10 to 15 miles distant, areas which would appear to offer illimitable possibilities for the growth of this cereal, which composes one-half the imports of tropical Africa. Rice, however, is regarded by the Fulani as an unsatisfying food, and they use the alluvial hollows after subsidence of the waters for planting a white grain in compact racemes, which is reaped about the end of January. An inferior variety of *Sorghum*, called "jigari," is the first article planted immediately on the definite advent of the rains, and this early maturing crop is unfortunately used, by Pagans at least, chiefly for the preparation of the intoxicating "peto," and, as a rule, only resorted to for food in the case of failure of the later crop of proper guinea-corn.

Sesamum indicum ("ridi" or "karkashi," Fufulde, "nome") is properly esteemed by the Fulani who make a sort of porridge of the seeds, called "marasiri." Various tubers add to the food supply both of the Fulani and of such Pagans as occupy the lower grounds, *e.g.*, the "gwaza" (Fufulde, "tandauje") *Colocasia antiquorum*? the taro of the east and of the Pacific; "tumuku" (Fufulde "metabela"), *Coleus dysentericus*, and "risga" (Fufulde, "bugumji"), *Syncolostemon* sp., both root tubers of plants of the *Labiatae*, and also curiously the large tap-root of *Tacca pinnatifida* (Hausa "giginiar biri" and "tara yayu," Fufulde, "bugulli"), which is

recognised as a food, but never cultivated as in southern seas. In some Fulani communities a girl at marriage brings to the new household, perhaps as evidence of her ability to undertake the cares of housekeeping, a large calabash of the prepared flour of each of the staple foods such as guinea corn, maize, &c., and the meal of this species is included in the list, from which one must suppose that its value as a food is better recognised by the Fulani than by the Hausas.

An unexpected find amongst the Batta Pagan tribe on the river was *Trapa bispinosa*. This floating plant, unknown so far as I have seen in the Hausa States, is called in Fufulde "birijin liam" (or "water arachis"), and appears to be cultivated in a sporadic manner by the riverine Pagan tribes in pools and marshes as it is in China and Tibet, the edible tuber being a sort of water caltrops.

The Pagan on his hills varies his culture slightly from that of the Fulani of the plains to suit the exigencies of his natural surroundings, but removal of his fear of a Fulani raid permits the extension of field operations beyond the immediate neighbourhood of the hill on which the village is placed. Guinea-corn and maize are cultivated where possible, the indispensable jigari for convivial purposes, obsequies of a chief and such festive occasions, and always a little cotton, even if only on their rock-stream declivities in pockets of soil laboriously carried from below to replace that yearly washed away by the rains from between the bases of the granite boulders. *Voandezia subterranea* ("kwaruru," or "gujia," Fufulde, "debbi") and *Arachis hypogaea* ("gedda," Fufulde, "biriji") can be grown on mere granite grit of gravel of the foot hills. "Aiya" (Fufulde, "watuje"), the small tuber of a species of *Cyperus*, is a staple food amongst the Pagans, and is cultivated also by their Mohammedan neighbours and former oppressors, who declare however that as a food it "does not fill the belly."

The Fulani who occupy permanent farming villages on the plains, between the river and the hills, live under rather miserable circumstances and appear to be worse off or less adaptive than their Pagan neighbours. The latter cultivate, in addition to guinea-corn, maize and ground-nut and also the yam-nut with only partial success, the tubers brought in by the mountain Pagans being comparatively small. The Fulani farmers grow sweet potatoes and cassava in place of yams, and in addition to a diet chiefly composed of the products of the cow, get some dried fish, or as a luxury kanwa or Bornu salt. To replace this necessary condiment both Pagans and the poorer Fulani use ashes prepared from various plants. Thus, on the plains the leaves of the "giginia" palm, (Fufulde, "dutbi") *Borassus flabelliformis*, and certain wild grasses which grow near the marshes, are burnt for this purpose, while the hill tribes being, as a rule, without the palm, use ashes from grass and the wood of some trees, *e.g.*, the shrub *Gymnosporia senegalensis*, ("namijin tsada" Fufulde, "tultulde"). The Verre and Chamba Pagans of both British and German Adamawa appear to supply the lack of fish by a soup made from rats, but being expert hunters they are seldom without the larger deer.

As pot-herbs any of the following may be found as ingredients for soup amongst both types of people—"okra," *Hibiscus esculentus*,

(Hausa, "kubewa," Fufulde, "baskoje," "takkei," soup of okra) which is, however, of sufficient value to be sent to town markets—"yakua," or "red sorrel" (Fufulde, "fulle") *Hibiscus Sabdariffa* —beans with their leaves—leaves of the kuka (Fufulde, "bokki") *Adansonia digitata*, with ground-nut oil and Sesamum leaf and seed.

To these cultivated plants are almost equally added parts of several wild species besides the "kuka" already mentioned, of which the following are the most used :—an Asclepiadaceous twiner "yadia" (Fufulde, "sokotoro") with viscid juice, the leaves of which are used all over the Protectorate in soup, or by the pastoral "borroro," boiled and pounded up with beans, the leaf of a large tree called "zuwo" (Fufulde, "wanko"), the young leaves of which are used in soup as well as a fodder for domestic animals, and lastly the bark of a shrub, *Grewia mollis* ("dargaza," Fufulde, "Kelli,") which is widely used as a food or as a thickening for soup.

Besides the small grass called "acha" (*Digitaria ternata ?*) which is cultivated much more widely in the central provinces, and the "tamba," *Eleusine coracana ?*, which is also sometimes cultivated, a number of wild fodder grasses are used for human food in time of scarcity. Some of these are :—"tumbinjaki" (etym. "donkey's belly," probably because unwholesome to donkeys if fed on it too long), *Paspalum scrobiculatum*, a sort of "hungry rice," the seeds of which may not infrequently be seen being ground like cultivated grain in riverside markets of the Bashima and Batta tribes on the Benue ; "burburwa" or "komaiya," *Eragrostis tremula* ; "gude-gude," *Dactyloctenium aegyptiacum*, probably only used in famine ; "baia," *Panicum* sp. near *P. albidulum* ; "tuji," *Eleusine indica*, and others of which I can at present only give the native names, "Zarikia," "Sabbe" and "aburo" or "ibiru."

XXI.—NEW LAURACEAE FROM THE MALAYAN REGION. I.

J. S. Gamble.

Cryptocarya Wrayi, *Gamble* [Lauraceae-Cryptocaryeae]; affinis *C. densiflorae*, Blume, sectionis *Caryodaphne*, sed foliis percoriaceis orbiculari-ovatis vix 7 cm. longis margine cartilagineis differt.

Arbor parva, ramulis puberulis paullo angulatis. *Folia* percoriacea, ovata vel orbiculari-ovata, apice vix acuta, basi truncata ; 5–7 cm. longa, 4–5 cm. lata ; supra glabra, nitida, infra glauca, minute puberula, margine cartilaginea ; 3-costata, costis lateralibus infra apicem desinentibus, nervis costae mediae utrinque 2–3, reticulatione obscura infra areolata ; petioli crassi, 5–10 mm. longi. *Cymae* paniculatae, terminales vel axillares, fulvo-pubescentes, ad 3 cm. longae, pedicellis brevissimis, bracteis deciduis. *Perianthii* tubus infundibularis, 1·5 mm. longus ; lobi tubum aequantes, orbiculares, intus ad faucem villosi. *Stamina* ordinum I et II 1·5 mm. longa, connectivo acuto, filamento crasso villoso ; ordinis III breviora, connectivo obtuso; staminodia ordinis IV triangulari-acuminata, 1 mm. longa, breviter stipitata; glandulae glabrae, 0·5 mm. longae, breviter stipitatae. *Ovarium* ovoideo-cylindricum, stylo tenui,

stigmate brevi capitato. *Drupa* depresso-globosa, glabra, obscure sulcata, ad apicem lobis perianthii persistentibus ornata, 1·5 cm. longa, 2 cm. diametro. *Semen* drupae conforme, testa membranacea, cotyledonibus crassis.

Malay Peninsula. Perak; at Gunong Bubu, Larut, 1500 m., *Wray*, 3853.

Cryptocarya bracteolata, *Gamble* [Lauraceae - Cryptocaryeae]; species sectionis *Eucryptocaryae* foliis infra caeruleo-glaucis, siccitate albis, et panicularum bracteis et bracteolis lincaribus insignis.

Arbor mediocris, ramulis teretibus minute griseo-puberulis, cum innovationibus et inflorescentia fulvo-tomentosis. *Folia* coriacea, ovata vel elliptica, apice obtuse acuminata, basi cuneata; 10–18 cm. longa, 4–8 cm. lata; supra parce lucida, glabra, infra caeruleo-glauca, siccitate alba, in costa et nervis fusco-puberula; nervis utrinque 6–8, nervulis transversis irregularibus et reticulatione subprominente junctis; petioli 1–2 cm. longi, torti. *Paniculae* terminales vel axillares, nigrescentes, tomentosae, foliis multo breviores, ad 5 cm. longae, bracteis et bracteolis linearibus ad 1 cm. longis, pedicellis 1–2 mm. longis. *Perianthii* tubus infundibuliformis, ad 5 mm. longus, superne incrassatus; lobi oblongi, rotundati, 3·5 mm. longi. *Stamina* ordinum I et II connectivo obtuso et filamento villoso, ordinis III connectivo acuto; staminodia ordinis IV cordato-acuminata, apice penicillata; glandulae rotundatae eximie stipitatae. *Ovarium* cum stylo gracili glabrum, stigmate capitato. *Drupa* nigra, glabra, depresso-globosa, 15 mm. longa, 18 mm. diametro, apice conspicue perianthio persistente munita. *Semen* drupae conforme, testa membranacea, cotyledonibus crassis, hemisphericis.

Malay Peninsula. Perak; near Larut on hills, 150-450 m., *King's Collector*, 6732, 7521.

Cyrptocarya Scortechinii, *Gamble* [Lauraceae - Cryptocaryeae]; species *C. Wightianae*, Thw., affinis, sed drupa oblongo-ellipsoidea crassiore praecipue differt.

Arbor ad 24 m. alta, trunci diametro ad 50 cm., ramulis angulatis puberulis, innovationibus fusco-pubescentibus. *Folia* coriacea, elliptica, elliptico-oblonga vel elliptico-lanceolata, apice plus minusve acuminata, basi attenuata; 10–20 cm. longa, 5–10 cm. lata; supra nitida, glabra, infra purpureo-grisea vel purpureo-glaucescentia, in costa et nervis pubescentia; nervis utrinque 6–9, nervulis transversis distantibus paucis et reticulatione prominente junctis; petioli crassi, 1–2 cm. longi. *Paniculae* ramosae, terminales vel axillares, ad 20–25 cm. longae, minute griseo-fusco-pubescentes, bracteis et bracteolis ovato-lanceolatis pubescentibus, pedicellis 1 mm. longis. *Perianthii* tubus infundibuliformis, 1·5 mm. longus; lobi ovati, tubum aequantes, intus puberuli. *Stamina* ordinum I et II antheris apice rotundatis, filamento villoso, ordinis III antheris apice cristatis; staminodia ordinis IV cordato-acuminata, dorso villosa; glandulae rotundatae, glabrae, parum stipitatae. *Ovarium* lanceolatum, glabrum, stylo gracili. *Drupa* oblongo-ellipsoidea, apice truncata, glabra, 3 cm. longa, 10–15 mm. diametro, exocarpio crasso rugoso. *Semen* oblongum, acutum, testa membranacea, cotyledonibus carnosis.

Malay Peninsula. Perak; at Thaiping, *Ridley*, 2966; at Gunong Haram, *Scortechini*, 568, 619; near Larut up to 1500 m., *King's Collector*, 6281, 6297, 6298, 6871, 8686, 10895. Sungei Ujong, *Ridley*, 5849.

Cryptocarya areolata, *Gamble* [Lauraceae-Cryptocaryeae]; species *C. amygdalinae*, Nees, affinis, foliorum nervulis et reticulatione prominulis differt; a *C. Scortechinii*, Gamble, praecipue differt paniculis brevioribus etiam foliorum reticulatione.

Arbor ad 20 m. alta, trunci diametro ad 50 cm., ramulis crassis, angulatis, fulvo-pubescentibus sicut innovationes et inflorescentia. *Folia* coriacea, ovata vel elliptico-ovata, apice obtusa vel obtuse acuta, rarius acuminata, basi cuneata (saepe inaequaliter), supra glabra, lucida, areolato-reticulata, infra purpureo-glauca; 10–20 cm. longa, 5–8 cm. lata; costa et nervi pubescentes, costa crassa, nervi utrinque 5–10, distantes, nervulis gracilibus, paralleli et reticulatione areolata conspicue juncti; petioli curvati, 2 cm. longi. *Paniculae* cymarum terminales vel axillares, fusco-pubescentes, ramosae, ad 15 cm. longae, bracteis et bracteolis ovato-lanceolatis caducis. *Perianthii* tubus cylindricus, 1·5 mm. longus; lobi ovati, aequales, 2·5 mm. longi, intus pubescentes. *Stamina* ordinum I et II antheris cristatis et filamentis villosis; ordinis III longiora prominenter cristata; staminodia ordinis IV sagittata, acuminata, basi et dorso villosa; glandulae magnae, rotundatae, villoso-stipitatae. *Ovarium* cylindricum, stylo gracili et stigmate capitato. *Fructus* non visus.

Malay Peninsula. Perak; at Sungei Larut, *Wray*, 2456; on low ground up to 250 m., *King's Collector*, 6017, 6171, 8630.

Cryptocarya bubongana, *Gamble* [Lauraceae - Cryptocaryeae]; species distincta *C. amygdalinae*, Nees, et *C. areolatae*, Gamble, affinis, sed notis plurimis differt, pracipue foliorum nervis prominentibus et reticulatione.

Arbor ad 20 m. alta, trunci diametro ad 60 cm., ramulis crassis angulatis fuscis. *Folia* coriacea, elliptica vel elliptico-oblonga, apice parum acuminata, basi rotundata et saepe inaequalia; utrinque glabra; 10–16 cm. longa, 3–6 cm. lata; nervi utrinque 6–9, supra parum impressi, subtus maxime prominuli nervulis transversis numerosis gracilibus et reticulatione minute areolata juncti: petioli curvati, parum puberuli, 10–15 mm. longi. *Paniculae* laterales, pauciflorae, quam folia breviores, fructiferae tantum cognitae. *Flores* ignoti. *Drupa* globosa, glabra, siccitate nigra, 10–12 mm. diametro.

Malay Peninsula. In open mixed forest on Ulu Bubong, 150–250 m., *King's Collector*, 10570.

Cryptocarya argentea, *Gamble* [Lauraceae-Cryptocaryeae]; species *C. Kurzii*, Hook. f., peraffinis, foliis minoribus minus acuminatis differt.

Arbor ad 20 m. alta, trunci diametro ad 50 cm., ramulis gracilibus pallide brunneis lenticellatis, ultimis minute puberulis. *Folia* coriacea, saepe bullata, oblonga vel oblongo-lanceolata, apice breviter obtuse acuminata, basi cuneata; utrinque glabra, supra nitida, infra argenteo-grisea, siccitate caeruleo-glauca; 8–15 cm. longa, 3–6 cm. lata; nervi et costa puberuli costa superne impressa, nervis utrinque

8–10 parum impressis, nervulis transversis irregularibus et reticulatione obscura ; petioli graciles, 9–12 cm. longi. *Paniculae* axillares vel terminales, graciles, ad 6 cm. longae, florentes ignotae. *Fructus* ignotus.

Malay Peninsula. Perak : in dense forest, 90–180 m., *King's Collector*, 7966.

Cryptocarya paucinervia, *Gamble* [Lauraceae - Cryptocaryeae] ; species *C. costatae*, Blume, affinis, fructu globoso nec oblongo, pedicellis crassis nec gracilibus et foliis minus nervosis differt.

Arbor ?, ramuli teretes, nigri, puberuli. *Folia* coriacea, lanceolata vel oblongo-lanceolata, apice obtuse acuminata, basi saepe inaequaliter attenuata ; supra et infra glabra ; 9–13 cm. longa, 3–5 cm. lata ; costa gracilis supra impressa ; nervi laterales utrinque 3–5, obliqui, distantes, supra impressi, nervulis nullis vel perpaucis obscuris sed reticulatione minutissime areolata ; petioli breves, 1 cm. longi, curvati. *Paniculae* axillares, foliis breviores, rhachi angulata. *Fructus* globosus, costatus, siccitate niger, 12–14 mm. diametro ; cotyledones crassi, hemispherici.

Sumatra. Mt. Goening, 200–250 m., *H. O. Forbes*, 2588.

Cryptocarya longepaniculata, *Gamble* [Lauraceae] ; species insignis *C. Griffithianae*, Wight, et *C. crassinerviae*, Miq., affinis, paniculis ramosis patentibus longissimis, floribus distantibus paullo vestitis, et bracteis minimis differt.

Arbor, ramuli crassi, sulcati, fulvo-puberuli. *Folia* coriacea, elliptica vel elliptico-oblonga, apice abrupte acuminata, basi rotundata ; 15–25 cm. longa, 6–11 cm. lata ; supra plus minusve lucentia et nervis exceptis glabra, infra glauca et griseo-pubescentia, intra nervos fusco-tomentosa ; costa crassa, profunde impressa, nervi omnes impressi laterales, utrinque 7–9, marginem versus curvati, nervulis multis parallelis inter se junctis, reticulatione conspicua ; pedicelli crassi, puberuli, 1–2 cm. longi. *Paniculae* terminales vel laterales, pubescentes, ad 30 cm. longae et 20 cm. latae ; pedunculi primarii ad 12 cm. longi, secundarii distantes, ad 6 cm. longi ; cymulae pauciflorae ; flores sessiles, bracteis tribus 1–2 mm. longis muniti. *Perianthii* tubus 3 mm. longus, infundibuliformis ; lobi ovati, subaequales, glandulosi, 2 mm. longi. *Stamina* ordinum I et II 1·5 mm. longa, connectivo supra rotundato, filamento hirsuto ; ordinis III caeteris aequilonga vel paullo longiora, connectivo longe producto ; staminodia ordinis IV cordata, longe acuminata, antice glabra, postice longe villosa, 1·5 mm. longa ; glandulae glabrae stipitatae rotundatae, ·5 mm. longae. *Ovarium* glabrum, oblongum, cum stylo gracili 2 mm. longum ; stigma obtusum. *Fructus* adhuc ignotus.

Borneo. Sarawak ; near Kuching, *Haviland & Hose*, 3295.

Cryptocarya fagifolia, *Gamble* [Lauraceae-Cryptocaryeae] ; species foliis chartaceis parvis iis *Fagi sylvaticae* similibus, paniculis multifloris et perianthii tubo distincto supra compresso insignis.

Arbor ?, ramuli graciles, striati, praecipue ad innovationes puberuli. *Folia* chartacea, elliptico-ovata vel lanceolata, apice obtuse caudato-acuminata, basi cuneata, juniora puberula, matura costa et nervis exceptis glabra ; 7–10 cm. longa, 3–4 cm. lata : costa gracilis sicut nervi supra impressa infra distincta, nervi utrinque 5–6

marginem versus curvati et inter se nervulis paucis subparallelis et reticulatione pulchre areolata junctis; petioli breves, 7–10 mm. longi. *Paniculae* axillares et laterales, fulvo-pubescentes, folia longe superantes et aliquando ad 15 cm. longae; rami patentes cymulis multis multifloris: bracteae lineares; bracteolae caducae minutae; flores subsessiles. *Perianthii* tubus cylindricus, superne constrictus, 1 mm. longus; lobi ovato-oblongi, acuti, 1·5-2 mm. longi, intus parce villosi. *Stamina* ordinum I et II rotundata, apiculata, filamentis villosis; ordinis III apice cristata; staminodia ordinis IV cordata, acuminata, dorso villosa; glandulae glabrae rotundatae, pedicellis brevibus villosis. *Ovarium* oblongum, glabrum, in stylum attenuatum, stigmate capitato. *Fructus* ignotus.

New Guinea. *H. O. Forbes*, 218.

Cryptocarya apamaefolia, *Gamble* [Lauraceae-Cryptocaryeae]; species fructu oblongo-conico et foliis infra glaucis, nervulis transversis conspicuis subregularibus insignis.

Arbor?, ramuli graciles, lenticellati, praecipue ad innovationes puberuli. *Folia* chartacea, oblongo-lanceolata, apice obtuse cuspidato-acuminata, basi saepe inaequaliter cuneata; supra lucida et costa excepta puberula, infra glauca et glabra; 12–18 cm. longa, 5–7 cm. lata; costa gracilis supra impressa, nervi laterales utrinque 5–6, obliqui, marginem versus curvati et cum eo nervulis arcuatis conjuncti, pare infimo gracili prope marginem, nervulis transversis gracilibus subparallelis subregularibus, reticulatione minuta: petioli 1 cm. longi. *Paniculae* laterales, pauciflorae, brevissimae. *Fructus* oblongus, apice conicus, siccitate niger, 20 mm. longus, 6–8 mm. latus (immaturus).

New Guinea. *H. O. Forbes*, 401.

Cryptocarya Forbesii, *Gamble* [Lauraceae-Cyptocaryeae]; ad *C. tomentosam*, Blume, accedit, at floribus majoribus et foliis minus tomentosis subtus haud glaucis differt.

Arbor, ramuli crassi, sulcati, adpresse fulvo-puberuli. *Folia* coriacea, ovata vel ovato-oblonga, apice obtusa vel obtuse acuminata, basi rotundata saepissime inaequalia; siccitate rufa, supra glabra, lucentia, subtus parce fulvo-puberula, ad costam et nervos villosa; 10–15 cm. longa, 5–10 cm. lata; costa crassa supra impressa; nervi laterales 8–12, supra haud impressi, subtus prominentes, patentes, marginem versus curvati et nervis paucis secundariis et nervulis plus minusve parallelis inter se juncti, reticulatione minuta; pedicelli crassi, fulvo-puberuli, 10–15 mm. longi. *Paniculae* laterales, fusco-puberulae, ad 10 cm. longae et 5 cm. latae; pedunculi primarii 2 cm. longi, secundarii 1 cm. longi, cymis multifloris corymbosis; flores pedicellati, bracteis parvis cito deciduis muniti. *Perianthii* tubus 2 mm. longus, cylindricus; lobi oblongi, tubo aequilongi, intus fulvo-villosi. *Stamina* ordinis I et II 1·5 mm. longa, connectivis supra obtuse acutis incurvis, filamentis hirsutis; ordinis III caeteris aequilonga, connectivo breviter cristato; staminodia ordinis IV cordata, obtuse acuta, postice fulvo-villosa, antice glabra, 1 mm. longa; glandulae rotundatae, glabrae, 0·5 mm. longae, villoso-stipitatae. *Ovarium* glabrum, stylo gracili et stigmate obtuso. *Fructus* ignotus.

New Guinea. *H. O. Forbes*, 640.

Cryptocarya macrophylla, *Gamble* [Lauraceae - Cryptocaryeae]; species foliis magnis et fructu costato insignis, speciebus adhuc cognitis haud propinqua.

Arbor ?, ramuli crassi, siccitate nigri, sparse lenticellati. *Folia* chartacea, obovata, apice breviter acuminata, basi attenuata, utrinque glabra, supra pallide virentia, subtus caesia; 25–30 cm longa, 10–12 cm. lata; costa crassa supra paullo immersa, nervi laterales utrinque 9–12, distantes, marginem versus curvati, et nervulis subparallelis vix conspicuis juncti, reticulatione minuta; petioli crassi, 15 mm. longi. *Paniculae* laterales et axillares, foliorum dimidium aequantes; rami angulati, patentes; pedicelli breves, vix 1 mm. longi. *Flores* ignoti. *Fructus* globosus, profunde costatus, costulis circa 15, 1 cm. diametro, glaber, siccitate niger, rugosus.

New Guinea. Near Anda, *Teysmann*, Hort. Bog. 7453.

Beilschmiedia insignis, *Gamble* [Lauraceae-Apollonieae]: species cum sequente foliis percoriaceis magnis, paniculis etiam longis insignis.

Arbor mediocris ad 20 m. alta et 60 cm. trunci diametro, ramulis crassis glabris lenticellatis. *Folia* percoriacea, opposita vel alterna, oblonga vel oblongo-oblanceolata, apice acuta, basi attenuata, glabra, lucida; 20–35 cm. longa, 7–12 cm. lata; costa crassa infra siccitate carinata, nervis utrinque 10–15 supra parum impressis, nervulis transversis angulatis infra cum reticulatione conspicuis; petioli crassi, supra sulcati, 20–25 mm. longi. *Paniculae* axillares, graciles, ad 12 cm. longae, rhachi glabro complanato, ramulis paucifloris, pedicellis gracilibus, 2 mm. longis. *Perianthii* tubus cupularis 1 mm. longus; lobi ovati, obtusi, 1·5 mm. longi. *Stamina* ordinum I et II 1·5 mm. longa, filamentis latis albo-villosis et connectivo rotundato; ordinis III longiora glandulis ad basin 2 latis obtusis stipitatis; staminodia ordinis IV cordata, acuminata, stipitata, quam glandulae paullo longiora. *Ovarium* ovoideum, stylo brevi, stigmate bifido. *Drupa* globosa, aspera, 3–4 cm. diametro, breviter apiculata.

Malay Peninsula. Perak; on low ground, below 30 m. in alt., *King's Collector*, 6615, 8479.

Beilschmiedia Kunstleri, *Gamble* [Lauraceae-Apollonieae]; species insignis magnitudine foliorum ut in praecedente *B. insigne*, Gamble, a quo foliis obovatis perianthii lobis longioribus et staminibus longis differt.

Arbor magna, ad 30 m. alta et 60 cm. trunci diametro, ramulis crassissimis 1–2 cm. diametro, cortice aspero. *Folia* percoriacea, opposita vel alterna, obovata vel obovato-oblonga, apice obtusa vel obtuse acuta, basi longe attenuata, glabra, lucida, prominenter reticulata; 25–35 cm. longa, 9–12 cm. lata; costa supra impressa, nervis utrinque 10–12 supra impressis, nervulis transversis multis cum reticulatione irregularibus: petioli crassissimi, puberuli, 1·5–2·5 cm. longi. *Paniculae* axillares, ramosae, puberulae, ad 20 cm. longae, rhachi angulari complanato; pedicellis gracilibus, 1–2 mm. longis. *Perianthii* tubus brevissimus intus infra stamina villosus; lobi oblongi, obtusi, glandulosi, 4 mm. longi. *Stamina* ordinum I et II gracilia, 2–2·5 mm. longa, filamento villoso, connectivo acuto; ordinis III similia glandulis 2 rotundatis stipitatis prope basim; staminodia ordinis IV cordata, acuminata, stipitata, dorso villosa, 1 mm. longa. *Ovarium* ovoideum, gradatim in stylum gracile

attenuatum, stigmate obtuso. *Drupa* obovoidea, rugosa, glabra, apiculata (immatura tantum).

Malay Peninsula. Perak; on low ground near Larut, *King's Collector*, 6854. Singapore; at Bukit Timah, *Bayliss*, 5885.

Beilschmiedia Curtisii, *Gamble* [Lauraceae-Apollonieae]; species *B. malaccensi*, Hook. f., affinis, sed foliis tomentosis, foliorum nervatione, perianthii tubo obconico et staminodiis brevissime stipitatis differt.

Arbor, ad 20 m. alta, ramulis crassissimis dense fusco-tomentosis. *Folia* coriacea, alterna, elliptica, apice rotundata, acumine brevissimo, basi etiam rotundata vel obtuse acuta, supra lucida et praeter costam et nervos glabra, infra purpureo-fusco-tomentosa, marginibus recurvis; 15–30 cm. longa, 8–13 cm. lata; costa crassa, nervis utrinque 10–12 supra impressis infra prominulis, nervulis transversis irregularibus, cum reticulatione supra prominentibus; petioli crassissimi, fusco-tomentosi, 2–3 cm. longi. *Paniculae* axillares, breves, corymbosae, fusco-tomentosae, ad 2·5 cm. longae, bracteis ovatis caducis, pedicellis gracilibus 1·5–2 mm. longis. *Perianthii* tubus obconicus; lobi ovati vel oblongi, prominenter ferrugineo-villosi, 3–3·5 mm. longi. *Stamina* ordinum I et II 1·5–2 mm. longa, obtusa, filamentis villosis; ordinis III longiora, glandulis 2 brevissimis cordatis prope basin; staminodia ordinis IV 1 mm. longa, brevissime villoso-stipitata. *Ovarium* conoideum, glabrum, stylo gracili, stigmate parvo capitato. *Drupa* oblonga vel obovoidea, nigra, laevis, 2·5 cm. longa, 12–15 mm. lata, pericarpio lignoso, pedicellis ad 3 mm. diametro incrassatis.

Malay Peninsula. Penang; on Government hill, 600 m., *Curtis*, 1015. Singapore; in garden jungle, *Ridley*, 8075.

Beilschmiedia Scortechinii, *Gamble* [Lauraceae - Apollonieae]; species *B. malaccensi*, Hook. f., affinis sed foliis suboppositis et inflorescentia ferrugineo-pubescenti differt.

Arbor, ramulis crassis prominenter lenticellatis ferrugineo-pubescentibus. *Folia* coriacea, subopposita, oblongo-lanceolata, apice acuminata, basi attenuata, supra praeter costam glabra, infra ferrugineo-puberula; 12–20 cm. longa, 3–5 cm. lata; costa crassa, nervis utrinque circa 12, reticulatione irregulari areolata; petioli crassi, ferrugineo-pubescentes, 1·5–2·5 cm. longi. *Paniculae* axillares, ferrugineo-pubescentes, pauci-ramosae, ad 12 cm. longae et 6 cm. latae, ramulis et rhachi complanatis, pedicellis 2 mm. longis, bracteis et bracteolis minimis caducis. *Perianthii* tubus campanulatus, 1·5 mm. longus; lobi oblongi, 2·5 mm. longi, intus fulvo-villosi. *Stamina* ordinum I et II crassa, filamento pubescente, connectivo obtuso vel emarginato; ordinis III caeteris aequilonga sed gracillima, apice emarginata, glandulis 2 cordatis stipitatis; staminodia ordinis IV cordata obtusa, antice concava, postice pubescentia, glandulis subaequalia. *Ovarium* puberulum, stylo gracili, stigmate obtuso. *Fructus* ignotus.

Malay Peninsula. Perak: at Caulfield's Hill, 1220 m., *Scortechini*, 483, 493.

Beilschmiedia lumutensis, *Gamble* [Lauraceae-Apollonieae]; species distincta, foliis oppositis glabris, paniculis gracilibus paucifloris et floribus minimis insignis.

Arbor (?), ramulis gracilibus glabris purpurascentibus. *Folia* opposita, coriacea, reticulata, elliptica vel elliptico-oblonga, apice acuta, basi attenuata, glabra, nitida ; 10–14 cm. longa, 4–6 cm. lata ; costa gracilis, nervis utrinque 8–10, reticulatione prominenter areolata ; petioli 7–12 cm. longi, purpurei. *Paniculae* axillares, glabrae, 4–6 cm. longae, ramis elongatis gracilibus, pedunculo crasso 2–3 mm. longo, floribus minutis subglabris. *Perianthii* tubus campanulatus praeter annulum villosum intus glaber, glandulosus ; lobi breves, ovati vel orbiculares, glabri, cum tubo 1·5 mm. longi. *Stamina* ordinum I et II ad 1 mm. longa, connectivo acuto ; ordinis III similia, glandulis 2 ad basin magnis ; staminodia ordinis IV cordata, stipitata, glabra vel filamentis parce villosis. *Ovarium* ovoideum, glabrum, stylo brevi, stigmate obtuso.

Malay Peninsula. Perak ; at Lumut Dinding, *Ridley*, 10323.

Beilschmiedia perakensis, *Gamble* [Lauraceae-Apollonieae] ; species *B. longipedi*, Hook. f., affinis, foliorum forma et textura, nervis irregularibus et paniculis rufescentibus differt.

Arbor parva vel arbuscula ad 12 m. alta et 25 cm. trunci diametro, ramulis gracilibus fuscis parum pubescentibus. *Folia* alterna, chartacea, juniora membranacea, elliptica vel elliptico-obovata, apice brevissime acuminata, basi cuneata vel attenuata, supra praeter costam et nervos glabra, infra minute puberula ; 8–15 cm. longa, 4–7 cm. lata ; costa non nimis crassa, nervis utrinque 10–12, irregularibus, nervulis transversis prominentibus et reticulatione conspicua inter se junctis ; petioli crassi, pubescentes, 5–10 mm. longi. *Paniculae* axillares, graciles, ferrugineo-pubescentes, ad 10–14 cm. longae, pedunculo longo, ramulis paucis ; bracteis et bracteolis linearibus, pedicellis gracilibus. *Perianthii* tubus brevissimus ; lobi ovati, obtusi vel parum acuti, 1·5 mm. longi. *Stamina* ordinum I et II gracilia, 1 mm. longa, connectivo rotundato, filamento puberulo ; ordinis III longiora, glandulis 2 ad basin ovoideis stipitatis ; staminodia ordinis IV ovata, acuta, brevia. *Ovarium* oblongum, stylo brevi, stigmate obtuso. *Drupa* oblonga vel obovoidea, nigra, 12–15 mm. longa, 7–8 mm. lata, pericarpio crasso ; pedicellis vix incrassatis. *Semina* cotyledonibus crassis.

Malay Peninsula. Perak, *Scortechini* ; on hills, 150–250 m., *King's Collector*, 8489, 10026, 10432.

Beilschmiedia penangiana, *Gamble* [Lauraceae-Apollonieae] ; species floribus racemosis bracteatis, foliis membranaceis rufescentibus et ramulis albis distincta.

Arbor ad 10–12 m. alta, ramulis albis lucidis, lenticellis oblongis. *Folia* membranacea, alterna vel subopposita, glabra, elliptica vel elliptico-lanceolata, apice obtusissime acuminata, basi acuminata ; 7–10 cm. longa, 3–4 cm. lata ; costa lata, supra impressa, nervis utrinque 10–12 irregularibus supra et infra prominentibus, nervulis transversis etiam prominentibus, reticulatione obscura ; petioli lati, 5–10 mm. longi. *Racemi* axillares, breves, bracteis sub floribus orbicularibus fimbriatis bracteolis 2 lanceolatis amplectentibus, pedicellis crassis. *Perianthii* tubus brevis ; lobi ovati, ciliati, 1 mm. longi, subaequales. *Stamina* ordinum I et II 1 mm. longa, glabra, filamentis crassis ; ordinis III similia, glandulis 2 ad basin suborbi-

cularibus stipitatis ; staminodia ordinis IV cordata, brevissime stipitata, 5 mm. longa. *Ovarium* globosum, glabrum, stylo brevi, stigmate obtuso. *Fructus* ignotus.

Malay Peninsula. Penang; at Penara Bukit, 300 m., *Curtis*, 1098.

Beilschmiedia membranacea, *Gamble* [Lauraceae-Apollonieae] ; species *B. perakensi*, Gamble, affinis, foliis membranaceis ellipticis et drupa oblonga.

Arbor parva, ad 6 m. alta et 15 cm. trunci diametro, ramulis gracilibus griseis molliter nigro-puberulis, innovationibus ferrugineo-tomentosis. *Folia* membranacea, alterna, elliptica vel elliptico-ovata, apice obtuse acuminata, basi attenuata vel inaequaliter rotundata, praeter costam et nervos glabra; 10–15 cm. longa, 5–8 cm. lata ; costa gracilis, nervis utrinque 9–11 reticulatione irregulari supra et infra prominulo junctis ; petioli crassi, 5–10 mm. longi. *Flores* ignoti, ut videtur in cymis brevibus axillaribus. *Drupa* oblonga, laevis, ad 15 mm. longa, 7 mm. diametro, pedicellis vix incrassatis.

Malay Peninsula. Perak; in open forest, 600–900 m., *King's Collector*, 10928.

Beilschmiedia pahangensis, *Gamble* [Lauraceae - Apollonieae] ; species distincta, foliis lanceolatis chartaceis et drupa ellipsoidea insignis.

Arbor, ramulis gracilibus griseo-fuscis glabris. *Folia* chartacea, alterna, lanceolata vel oblongo-lanceolata, apice obtuse acuta, basi longe attenuata vel cuneata, glabra, prominenter reticulata, supra lucida ; 10–15 cm. longa, 3–5 cm. lata ; costa gracilis, nervis utrinque 10–12 irregularibus prope marginem anastomosantibus nervulis et reticulatione irregulari prominentibus : petioli graciles, 1–2 cm. longi, rugosi. *Paniculae* axillares, ad 6 cm. longae ; flores ignoti. *Drupa* ellipsoidea, obtusa, nigrescens tuberculis pallidis, 2–2·5 cm. longa, 1 cm. lata. *Semina* cotyledonibus carnosis.

Malay Peninsula. Pahang ; at Kwala Triang and Suboo Lanjoot, *Ridley*, 2273.

Beilschmiedia Foxiana, *Gamble* [Lauraceae-Apollonieae] ; species foliis coriaceis lanceolatis et drupa longa insignis.

Arbor ?, ramulis crassis laevibus lenticellatis. *Folia* coriacea, subopposita, prominenter reticulata, lanceolata vel oblanceolata, apice obtuse acuminata, basi longe cuneata, glabra, margine parum recurva ; 12–16 cm. longa, 5–7 cm. lata ; costa crassa, nervis utrinque 7 obliquis, prope marginem seriatim arcuatis, nervulis transversis irregularibus et reticulatione areolata prominente junctis ; petioli crassi, 2–2·5 cm. longi. *Panicula* ramosae, ad 20 cm. longae, glabrae, pedunculis et ramis lenticellis oblongis notatis ; flores ignoti. *Drupa* ellipsoidea, pustulata, 3·5 cm. longa, 2–2·5 cm. lata, pedicellis incrassatis ferrugineo-fuscis rugosis.

Malay Peninsula. Penang ; at Birch's Hill, *Fox*, 10705 (Herb. Singap.).

Dehaasia nigrescens, *Gamble* [Lauraceae-Apollonieae] ; species *D. cuneatae*, Blume, affinis, sed foliis chartaceis lanceolatis minus reticulatis haud ad apices ramulorum fasciculatis.

Arbor, ad 10–12 m. alta, ramulis gracilibus griseo-albis ultimis siccitate nigris. *Folia* chartacea, lanceolata vel oblanceolata, apice obtuse longe acuminata, basi attenuata, glabra, siccitate nigrescentia ; 8–13 cm. longa, 3–4 cm. lata ; costa gracilis, nervis utrinque 8–10 curvatis et prope marginem inter se arcuatis ; petioli graciles, 1–2 cm. longi. *Paniculae* ex foliorum axillis ultimorum, graciles, glabrae, ad 10 cm. longae, pedunculo longo, ramis dichotomis, pedicellis clavatis, floribus minimis. *Perianthii* tubus cupularis cum pedicello continuus ; lobi parvi, 3 exteriores triangulares, 0·75 mm. longi, 3 interiores duplo longiores ovati, omnes subtus aureo-pubescentes, intus villosi. *Stamina* ordinum I et II clavata, 0·75 mm. longa, connectivis obtusis, filamentis villosis ; ordinis III paullo longiora, glandulis 2 magnis cordatis glabris ; staminodia ordinis IV 0·5 mm. longa, cordata, quam glandulae minora. *Ovarium* globosum, stylo brevi, stigmate obtuso. *Drupa* nigra, obovato-ellipsoidea, 2 cm. longa, 1 cm. diametro ; pedicello incrassato obconico recto vel curvato purpureo (siccitate nigro) insidens, perianthii lobis persistentibus.

Malay Peninsula. Penang ; on Government Hill, 300–600 m., *Curtis*, 1183. Singapore ; in garden jungle, *Ridley*, 13017.

Dehaasia Curtisii, *Gamble* [Lauraceae-Apollonieae] ; species *D. cuneatae*, Blume, affinis, paniculis glabris staminodiis minoribus et foliorum nervis vix impressis distincta.

Arbor parva, ramulis crassis asperis griseo-albis. *Folia* coriacea, ad apices ramulorum fasciculata, glabra, minute areolato-reticulata, supra lucida, infra glauca, marginibus recurvis ; 6–12 cm. longa, 3–5 cm. lata ; nervis utrinque 10–12 curvatis et prope marginem inter se arcuatis, reticulatione prominenter areolata ; petioli 1–2 cm. longi, nigri, canaliculati. *Paniculae* ex foliorum ultimorum axillis graciles, dichotomae, corymbosae, glabrae, 6 cm. longae, pedunculis 4–5 cm. longis parum complanatis, ramulis gracilibus, cymulis 3-floris, pedicellis clavatis cum tubo perianthii continuis, floribus minutis. *Perianthii* tubus cupularis ; lobi ovati, obtusi, 3 exteriores 1–1·5 mm. longi, 3 interiores 1·5–2 mm. longi, omnes parum pubescentes. *Stamina* minima, ordinum I et II 0·75 mm. longa, clavata, villosa, connectivo emarginato; ordinis III paullo longiora, obtusa, glandulis 2 magnis glabris prope basin ; staminodia ordinis IV minima, cordata, stipitata, postice villosa. *Ovarium* ovoideum, stylo gracili, stigmate obtuso. *Drupa* ellipsoidea, siccitate nigra, laevis, 1 cm. longa, 0·75 cm. diametro, pedicello incrassato clavato 5 mm. longo insidens.

Malay Peninsula. Penang : Government Hill ; at the Rifle Range, 750 m., *Curtis*, 1193. Selangor : top of Batu caves, *Kelsall*, 1986 ; *Ridley* (forma foliis et drupa minoribus).

Endiandra Kingiana, *Gamble* [Lauraceae-Acrodiclidieae] ; species *E. Maingayi*, Hook. f., affinis sed foliis majoribus infra pubescentibus latis et nervis paucioribus, etiam paniculis dense fulvo-pubescentibus differt.

Arbor 15–20 m. alta, ramis patulis, ramulis crassis lenticellatis ultimis glandulose ferrugineo-pubescentibus. *Folia* coriacea, elliptica, apice obtuse brevi-acuminata, basi acuta vel cuneata, supra lucida, minute areolata, glabra, infra etiam areolata, molliter

pubescentia ; 10–13 cm. longa, 6–7 cm. lata ; nervis utrinque 5–6 supra impressis pubescentibus, marginem versus curvatis et ibi arcuatim junctis, secundariis paucis, reticulatione areolata ; petioli crassi, fulvo-pubescentes, rugosi, 1·5–2 cm. longi. *Paniculae* breves, axillares vel terminales, fulvo-pubescentes, cymulis paucifloris, pedicellis nullis vel brevissimis, bracteis parvis caducis ; floribus lutescentibus. *Perianthii* tubus brevissimus, ferrugineo-pubescens ; lobi ad 3 mm. longi, ovato-oblongi, 3 exteriores longiores, omnes intus ad basin granuloso-glandulosi. *Stamina* ordinum I et II nulla ; ordinis III 3, crassa, conoidea, 1·5–2 mm. longa, supra ovarium conniventia, antheris sessilibus, thecis 2 elongatis ; staminodia nulla. *Ovarium* globosum, glabrum, 0·5 mm. diametro ; stylo crasso, stigmate capitato. *Drupa* non visa.

Malay Peninsula. Perak ; in dense jungle, 150–250 m., *King's Collector*, 6487 (descriptio praecipue ex Kingii notulis).

Endiandra praeclara, *Gamble* [Lauraceae-Acrodiclidieae] ; species insignis, ab *E. Maingayi*, Hook. f., et *E. Kingiana*, Gamble, foliis magnis glabris, paniculis elongatis, floribus majoribus et drupa maxima distincta.

Arbor ad 15–20 m. alta et 45–60 cm. diametro, ramis patulis, ramulis laevibus glabris striatis. *Folia* chartaceo-coriacea, elliptico-obovata vel oblonga, apice breviter obtuse acuta vel acuminata, basi cuneata vel interdum rotundata, glabra, conspicue areolato-reticulata ; 15–40 cm. longa, 5–17 cm. lata ; costa crassa supra depressa, nervis utrinque 8–10 irregularibus, pare infimo submarginali, reliquis primo rectis deinde curvatis et prope marginem arcuatim junctis, nervulis transversis haud prominulis sed reticulatione areolata junctis ; petioli crassi, rugosi, 10–15 cm. longi. *Paniculae* axillares vel subterminales, ramosae, ad 20 cm. longae et 10 cm. latae, subglabrae, pedunculis nullis vel brevibus, rhachi complanata ; cymulis puberulis paucifloris, pedicellis gracilibus 1–2 mm. longis, floribus luteis. *Perianthii* tubus cupularis, puberulus ; lobi ovati, 3 exteriores 2·5 mm. longi, 3 interioribus paullo longiores ; omnes extus glabri, intus basin versus granulato-glandulosi. *Stamina* ordinum I et II nulla, ordinis III crassa, conoidea, supra ovarium conniventia, 2 mm. longa, connectivo granuloso-glanduloso, antheris sessilibus, thecis distantibus oblongis ; staminodia ordinis IV nulla. *Ovarium* globosum, stylo brevi, stigmate capitato. *Drupa* oblongo-ellipsoidea, purpurea, laevis, 8–10 cm. longa, 4 cm. diametro, pericarpio tenuiori, cotyledonibus magnis carnosis.

Malay Peninsula. Perak ; at Tupai, *Wray*, 3097 ; near Larut up to 300 m., *King's Collector*, 4074, 6714.

Endiandra Wrayi, *Gamble* [Lauraceae-Acrodiclidieae] : species haud bene nota ; foliis glabris plus minusve lanceolatis coriaceis, nervis utrinque 5–7, drupa oblonga 2·5 cm. longa 1 cm. lata distincta.

Arbor parva, ramulis gracilibus lenticellatis, ultimis angulatis, rugosis. *Folia* coriacea, elliptico-oblonga vel oblanceolata, apice obtusissime acuminata, basi cuneata, glabra, areolato-reticulata, lucida, 7–14 cm. longa, 2–5 cm. lata, costa gracilis utrinque prominens, nervis utrinque 5–7 supra parum impressis obliquis primo rectis deinde curvatis et prope marginem arcuato-junctis,

reticulatione areolata ; petioli graciles, 5–10 mm. longi. *Flores* ignoti, in racemos vel paniculas axillares dispositi. *Drupa* oblonga, nigra, laevis, 2·5 cm. longa, 1 cm. diametro, pedunculo paullo incrassato.

Malay Peninsula. Upper Perak, 300 m., *Wray*, 3785.

Endiandra Forbesii, *Gamble* [Lauraceae-Acrodiclidieae] ; species *E. hypotephrae*, F. Muell., accedit, sed foliis majoribus minus pubescentibus et inflorescentia longiore differt.

Arbor, ramuli crassi, rugosi, minute puberuli. *Folia* coriacea, elliptico-oblonga vel lanceolata, apice longe cuspidato-acuminata, basi attenuata, supra glabra, infra minutissime puberula tandem glauca ; 18–23 cm. longa, 6–9 cm. lata ; costa crassa supra profunde impressa, infra prominens, nervis lateralibus utrinque 12–14 parallelis supra insigniter impressis, infra prominentibus, marginem versus leviter curvatis ; reticulatione supra et infra insigniter et minutissime areolata ; petiolus crassus, 15–20 mm. longus. *Paniculae* axillares, foliis longiores, fulvo-tomentosae, a medio ramosae, sparsiflorae ; rami pauci 2–3 cm. longi, cymulas pauciflоras ferentes ; bracteae ovatae ; pedicelli graciles ; flores 3–4 mm. diametro. *Perianthii* tubus brevis ; lobi 6, subaequales, ovati. *Stamina* ordinum I et II in annulum crassum rotundatum margine serratum mutata ; ordinis III 3, paullo exserta, 2-locularia, extrorsa, ovarium obtegentia, clavata, apice rotundata. 1·25 mm. longa ; staminodia ordinis IV nulla. *Ovarium* glabrum, in stylum brevem productum, stigmate obtuso. *Fructus* non visus.

New Guinea. *H. O. Forbes*, 543.

XXII.—A HISTORY OF THE GARDENS OF THE MALAY PENINSULA.

The following account of the Gardens of the Malay Peninsula has been extracted from an article entitled "The Abolition of the Botanic Gardens of Penang," by the Editor of the Agricultural Bulletin of the Straits and Federated Malay States, published in that journal for March, 1910, pp. 100–105.

"As has been mentioned in the first part of this article the Gardens doomed to disappear are the third gardens made and destroyed in Penang since its founding, and though reference has been made in a previous paper to the history of the Gardens of the Peninsula it will be interesting no doubt to many to read the story of the previous Gardens as fully as I have been at present able to trace their history. The first settlement at Penang was made in 1786, by Captain Light, and shortly after this the Honourable East India Company decided to start spice-gardens with a view of breaking down the Dutch monopoly of the spice cultivation and trade. So in 1794 Christopher Smith was appointed their Botanist, and in 1796 was sent to the Moluccas to collect living plants of nutmegs and cloves with which to start the cultivation. In 1798

five park-slaves from the Banda nutmeg parks, as they were called, arrived in Penang, sent by the Resident of Banda to look after the nutmegs and cloves, of which about 600 nutmeg plants and half a dozen clove trees had been already received in Penang. In May, 1800, there were 1,300 plants in the Gardens, which consisted of 20 orlongs at Ayer Hitam and 300 orlongs reserved at Sungei Cloan, chiefly for growing pepper. In June 29, the ship Amboyna arrived from Amboyna with 15,000 cloves and 500 nutmeg trees. The Botanic Gardens were now much enlarged, and it was urged that Mr. Smith should return and take charge of them as soon as possible. In 1802 there were 19,000 nutmeg trees and 6,250 cloves in the Gardens and altogether about 33,000 spice plants in the island.

"The first nutmeg fruit and the first mangosteen in Penang were produced in 1801. At this time Sir William Hunter, surgeon to the East India Company, was in charge of the Gardens, with a staff of fifty convicts. An account of the plants of Prince of Wales Island from a manuscript in the British Museum, was published recently by the Editor in the Journal of the Straits Branch of the Royal Asiatic Society, vol. 53. It shows that a number of other plants of a useful and ornamental character, many obviously sent from the Moluccas by Smith, were cultivated in the spice gardens. Among the plants recorded in this work and elsewhere are Cinnamon, Pimento Coffee, Kaya Puteh, Colelava (*sic*, probably clove bark, Kulit Lawan, *Cinnamomum Culilawan*, Bl.), Teak, Loquat, *Artabotrys odoratissima*, Canary nut, etc.

"Christopher Smith returned from the Moluccas and was appointed Superintendent of the Botanic Gardens in 1806, having sent to Penang 71,266 nutmeg plants, 55,264 cloves and large quantities of *Canarium commune*, the Canary nut, and *Arenga saccharifera*, the well known Kabong Palm.

"Capt. James Law, in his dissertation on the soil and agriculture of Penang (1836), describes the position and area of the Gardens thus :—'It comprised 130 acres of land lying on the slopes which skirt the base of the hill near Amie's mills, a romantic spot and well watered by a running stream called Ayer Puteh. It contained 19,628 nutmegs from one to four years old, 3,460 being four years old, and 6,259 clove trees, of which 669 were above six and under seven years old.' Hunter says the Gardens were in the valley of Ayer Hitam.

"Sir George Leith was Lieut. Governor but was succeeded by Col. R. T. Farquhar in 1803. He appears to have been a reckless and extravagant man, spending large sums on his own luxury and on useless fortifications.

"Hunter seems to have left the island about 1803, and Smith died in 1806, or soon after.

"The Gardens, which in 1804 to 1805 had a staff of 80 coolies and cost $11,909,41, were sold at 12 days' notice by auction for $9,656. The trees were dug up and carried off by the purchasers but most of them died. So ended the first Gardens of Penang.

"From 1805 to 1822 Penang possessed no gardens, then at the instance of Sir Stamford Raffles the second gardens were founded. They were also situated at Ayer Hitam, and put under the charge of a botanical school master, George Porter. These gardens existed

till 1834, when Governor Murchison who took no interest in gardens or agriculture sold them for 1,250 rupees because his wife could not get enough vegetables from them to diminish the cost of her cook's bills, and so ended the second Penang Gardens.

"There were no other gardens in Penang till 1884, nor do we hear of any attempts on the part of the Government to improve cultivation or develop agriculture in the meantime.

"On the founding of Singapore, Sir Stamford Raffles introduced nutmegs, cloves, and cocoa, and founded the first Botanic Gardens there in 1822. He writes to Marsden, January 31, 1823. 'I am laying out a Botanic and Experimental Garden' and to Dr. Wallich, February 8 : 'The Botanic Garden goes on well. I am now employed in laying out the walks and stones are collected to make a handsome hand railway round it' (Memoirs, by his Widow, pp. 535, 537). A superintendent of the name of Dunn was employed to look after it, as early as 1819. Dr. Wallich though no doubt much interested in the garden was not, as Buckley in his anecdotal history of Singapore says, superintendent. He had come down from Calcutta for his health in 1822 and returned in 1823. The gardens were on the North East of the Government house (Fort Canning) and were 48 acres in extent and a bungalow for the Superintendent was built in them. Sir Stamford Raffles left the East in 1823 ; a monthly vote of 60 dollars was allowed for the upkeep.

"In 1829 the establishment was discontinued and 10 convicts were put on to keep the ground in order. Lord George Bentinck had come as Governor-General. In 1827 Dr. Montgomerie who took much interest in agriculture and horticulture was superintending the gardens, and cultivating spices and endeavouring to induce planters to take them up as there was a good demand for them and Penang could not supply sufficient.

"Lord George Bentinck had been sent to retrench the expenditure of the colony and soon sold off the gardens, and that was the end of the first Singapore Gardens. By this time agriculture in Singapore was beginning to develop rapidly and Jose D' Almeida, T. C. Crane, Dr. Montgomerie and Dr. Oxley were doing their best to aid in its development.

"The Government however did not encourage these efforts. There were no gardens nor was there any botanist or agriculturist employed by them and the land-laws were so bad that in 1836 Dr. Montgomerie and others formed an Agri-Horticultural society to petition the Government to encourage agriculture. This does not seem to have been of much use as the same complaints were made in 1843. Though a great deal of good work was done by the amateurs, Montgomerie, Crane, Oxley, Almeida, Whampo and others, the utter absence of any professional agriculturist who could employ his whole time in the study of agriculture prevented its becoming a really important feature in the progress of the country. Practically no new plants were introduced, no investigations into pests, no improved methods of cultivation tried during this period.

"The same year that the Singapore Agri-Horticultural Society was founded a similar one was formed in Penang, but probably died in the same year, viz., in 1846. Three years after, Dr. Montgomerie, the leading spirit, left Singapore. Another Horticultural Society

was founded in Singapore in 1859 or 1860. It got hopelessly into debt in 1873, and the Government eventually took over its property in 1878, and thus was founded the second Botanic Gardens of Singapore.

"The apathy of the Government from 1829 to 1860 naturally ended in disaster, which took the form of a ruinous collapse of the most important industry in Penang and Singapore, viz., the nutmeg cultivation. The trees died wholesale in a single night apparently from the attacks of a beetle. Cullingwood thus describes the catastrophe. 'The planters abandoned the plantations in disgust in many cases where there were still numerous healthy trees and the land reverted to Government. In other cases, where expensive bungalows had been built upon the estate, they were sold for a small proportion of the sums expended in building them since they were as a rule too far from town to command any competition and ceased to be conveniently situated. Many planters, both English and Chinese, whose whole estates were invested in nutmeg plantations were thus reduced to ruin and absolutely penniless and distress and disappointment everywhere prevaled.' Had the Penang Garden, abolished by Bentinck, been maintained and suitable superintendents employed to watch the interests of the planters, this catastrophe would probably have never occurred or at worst would have been much mitigated.

"But to return to the Gardens. The Singapore Gardens really commenced in 1875 when H. J. Murton was appointed to take charge of the agri-horticultural gardens now under Government though not formally so till 1878. He was succeeded by N. Cantley, in 1880, who established the third Penang Gardens in 1884, and the Malacca Gardens at Bukit Sabukor in 1886. These Gardens, over which Mr. Derry had control, were very useful in experimental work and in supplying economic plants to the Malacca planters. They were abolished by Sir Charles Mitchell, in 1896, and as a large portion of the ground had been presented to the Government by a Chinaman on condition that they should serve as a Botanic Garden for Malacca and revert to him when no longer so used, the ground on the abolition of the gardens was returned to the former owner.

"In Perak, Sir Hugh Low took a great interest in agriculture at a time when there was practically no agriculture worthy of the name in the Peninsula, and he founded several gardens or experimental stations for the introduction and cultivation of economic plants. I have found very few records of this work but it appears that most of them were instituted in about 1875 or 1876. They comprised the Gardens of Kuala Kangsar, the Tea Gardens and Maxwell's Hill Gardens, on the Taiping Hills the Hermitage Hill Garden and Waterloo Garden, and Telok Anson.

"After Sir Hugh Low retired from the Peninsula these were all abandoned or sold or remained as gardens attached to various bungalows or Government residences. In any cases, they lost the status intended and established by him.

"In 1903 an economic garden was started at Batu Tiga near Kuala Lumpur, and Mr. Stanley Arden was put in charge. It contained only economic plants and was liberally supplied free with these from the Singapore Botanic Gardens and it contained eventually a very complete series of plants likely to prove useful to planters.

" Mr. Arden left about 1906, and the garden seems to have been practically abandoned shortly afterwards, but we understand that the camphor bushes and rubber trees are still being protected.

" The Federated Malay States Agricultural Department commenced to open out a considerable area of ground for planting rubber and camphor trees, near Kuala Lumpur, in 1906, and this work appears to be progressing.

" Thus we have the history of the Botanic Gardens of the Malay Peninsula as follows :—

	(Founded)	(Abolished)
First Penang Garden	1800	1805
Second Penang Garden	1822	1826
First Singapore Garden	1823	1829
Second Singapore Garden	1878	still existing
Third Penang Garden	1884	1910
Malacca Garden	1886	1894
Kuala Kangsar Garden	1876	before 1888
Maxwell's Hill, Tea Gardens	1882	„
Hermitage Hill	before 1880	1893
Waterloo Hill	„ „	before 1888
Durian Sabatang or Telok Anson	„ „	„
First Select Garden	1903	1906
Kuala Lumpur Experiment Plots	1906	existing

" This does not include such smaller nurseries as the hill experimental garden at Penang, the Kubang Ulu Nursery, the Damansara road nursery, Kuala Lumpur, also mostly abandoned, nor the various bungalow gardens and parks kept up by the Government such as the Lake Club Gardens, at Kuala Lumpur, the Taiping Gardens, Reservoir Gardens, etc., which cannot be classed as Botanic Gardens in any sense of the word.

" I have no clue as to the exact dates of any of these gardens. Possibly some of our readers may be able to give more of their history.

" The table above shows that no less than 14 Botanic Gardens and stations have been founded in the Malay Peninsula in little more than a century and of these 11 have been abolished, after a life of from four to fourteen years.

" The Gardens which have existed longest are the Botanic Gardens of Singapore, 32 years, and the next oldest are the Penang Gardens now abolished. The remainder from about four to eight years.

" This is certainly unique in the history of the Gardens of the Empire and indeed of the foreign nations, too, and represents a great amount of hard work by energetic men, and a great deal of money thrown away.

" To compare this with other gardens ; that of Peradeniya, Ceylon, was founded in 1821 and has gone on without a break ever since, that is for 89 years. That of Buitenzorg was founded in 1819 and has run continuously. The Botanic Gardens at Calcutta were founded in 1787, Trinidad about 1827, Sydney 1788. These Gardens have all run continuously on the same ground ever since they were founded. There has been none of the making and abolishing after a few years in the manner which seems to have characterised the

Straits Settlements. It may be taken that it requires at least 20 years with a suitable staff and sufficient funds to make a practical and well-stocked Botanic Garden and the longer it lasts and the more continuous its existence in a well found condition, the greater its value. The uncertainty of continuity naturally prevents the Botanist in charge from carrying out satisfactorily researches on slow-growing trees or any of that most important series of investigations which require many years of continuous experiment and observation for their solution, but this must be obvious to every thinking person.

"The story, which is as historically accurate as the author has been able to make it, will, he thinks, be read with astonishment and interest by many agriculturists and botanists. It is a history of enthusiasm, energy and hard work of men who devoted themselves heart and soul to the progress of agriculture and built up Gardens for this purpose which were destroyed ruthlessly after the enthusiast was gone, with the inevitable result of delay of progress, failure of agriculture and catastrophe."

XXIII.—NEW ORCHIDS: DECADE 35.

341. **Bulbophyllum nigrescens**, *Rolfe*; a *B. secundo*, Hook, f., floribus duplo majoribus differt.

Rhizoma repens. *Pseudobulbi* depresso-ovoidei, circa 1·5 cm. longi, 1·5–1·8 cm. lati, monophylli. *Folia* breviter petiolata, oblonga vel lineari-oblonga, subobtusa, subcoriacea, 5–11 cm. longa, 1·2–1·5 cm. lata. *Scapi* graciles, pallidi, basi vaginis paucis obtecti; racemi 8–10 cm. longi, multiflori. *Bracteae* oblongo-lanceolatae, acutae, 2 mm. longae. *Pedicelli* 5–7 mm. longi. *Flores* penduli. *Sepala* subpatentia, elliptico-oblonga, obtusa, 6–8 mm. longa, intus hirsutula; lateralia postico paullo latiora. *Petala* spathulata, hirsuta, 2 mm. longa. *Labellum* carnosum, elliptico-oblongum, obtusum, ciliatum, 6–7 mm. longum, basi canaliculatum. *Columna* vix 2 mm. longa: dentes oblongi, obtusi, breves.

Siam. Near Chiengmai, *A. Kerr*, 84.

Sent for determination from the Botanic Garden, Trinity College, Dublin, by Dr. H. H. Dixon, in May, 1909. The sepals are lined and more or less dotted with blackish purple on a light yellow ground, and the petals and lip blackish-purple, the latter with a green area at the base. Two forms sent differ somewhat in detail, but they appear to be forms of a single species, for which they were collected.

342. **Megaclinium lutescens**, *Rolfe*: a *M. minuto*, Rolfe, rhachi duplo angustiore, sepalo postico acuminato facile distinguendum.

Rhizoma repens, subgracile. *Pseudobulbi* subdistantes, ovoideo-oblongi, tetragoni, circiter 1·5 cm. longi, diphylli. *Folia* sessilia, anguste oblonga, obtusa, subcoriacea, 2–3·5 cm. longa, 5–7 mm. lata. *Scapi* subpatentes, 3–4 cm. longi; rhachis angustissima, scaberula, 2–3 cm. longa, marginibus obtusis. *Bracteae* reflexae, triangulari-oblongae, acutae, 2 mm. longae. *Pedicelli* 2 mm. longi. *Sepala* extus scaberula; sepalum posticum elliptico-oblongum, acutum, concavum, circiter 5 mm. longum; sepala lateralia oblique ovato-

triangularia, acuminata, 3 mm. longa. *Petala* lineari-oblonga, falcata, acuminata, 3 mm. longa. *Labellum* recurvum, 1–5 mm. longum, basi late ovatum, apice oblongum, obtusum. *Columna* late oblonga, 1·5 mm. longa, dentibus oblongis obtusis brevibus.

Tropical Africa. Gold Coast, *Band.*

Flowered at Kew in November, 1909. Flowers honey-yellow.

343. **Phaius Cooperi,** *Rolfe*; a *P. calloso*, Blume, floribus majoribus, labelli calcare attenuato et duplo longiore differt.

Pseudobulbi ovoideo-oblongi, circiter 5 cm. longi, apice 4–5-phylli. *Folia* elongato-lanceolata, acuminata, plicata, basi attenuata et circa caulem convoluta, 40–70 cm. longa, 6–9 cm. lata. *Scapi* erecti, validi, 40–50 cm. alti, multiflori. *Bracteae* elliptico-lanceolatae, subacutae, concavae, circiter 4 cm. longae, deciduae. *Pedicelli* validi, circiter 3 cm. longi. *Flores* magni, speciosi. *Sepala* oblonga, apiculata, carinata, marginibus revolutis, 5 cm. longa, demum decidua, lateralia patentia. *Petala* subspathulato-oblonga, apiculata, marginibus revolutis, sepalis paullo brevioribus et angustioribus. *Labellum* infundibuliforme, circiter 4 cm. longum, columnae marginibus fere ad medium adnatum; limbus trilobus, undulatus; lobi laterales rotundati; lobus intermedius subrecurvus, quadratus, emarginatus; discus obtuse bicallosus; calcar lineare, strictum, 2–2·5 cm. longum. *Columna* clavata, 3 cm. longa, apice anguste alata.

Habitat unknown.

A striking species. All that is known of the history of this plant is that it flowered in the collection of Mr. A. J. Hollington, Forty Hill, Enfield, where it had been cultivated as *Calanthe veratrifolia*, under which name it was obtained. It was purchased by Messrs. Sander & Sons, who exhibited it at the Royal Horticultural Society's meeting held on January 11th, 1910, when it received a Botanical Certificate. Its history and affinity suggest a Malayan habitat. The sepals and petals are bright red-brown in front, and pale yellow behind, and the lip is white at first, soon changing to light-yellow. There are a few reddish markings in the throat, and a pair of lateral red-brown blotches near the apex of the tube outside. It is named by request after Mr. E. Cooper, one of Messrs. Sander's foremen.

344. **Lissochilus Andersoni,** *Rolfe*; a *L. Millsoni*, Rolfe, sepalis latioribus et labello breviore differt.

Rhizoma crassum. *Folia* non vidi. *Scapi* erecti, circiter 50 cm. alti, basi vaginis paucis lanceolatis obtecti; racemi laxi, 4–8-flori. *Bracteae* deltoideo-lanceolatae, acuminatae, 1–1·4 cm. longae. *Pedicelli* 1·5–2 cm. longi. *Flores* 2–2·3 cm. longi, pallide sulfurei. *Sepala* subpatentia, lineari-lanceolata, acuta, 2–2·5 cm. longa; lateralia apice subfalcata. *Petala* erecta, parallela, elliptico-oblonga, subobtusa, 2 cm. longa, 1 cm. lata. *Labellum* 3-lobum, 2·5 cm. longum; lobi laterales late oblongi, obtusi vel truncati, erecti, 1·2 cm. longi; lobus intermedius suborbicularis, obtusus, margine undulato et lateribus recurvis; discus carinis 5–7 verrucosis pallide purpureis instructus; saccus conicus, obtusus, 4–5 cm. longus. *Columna* clavata, subcompressa, 1·2 cm. longa; anthera apiculata.

Tropical Africa. Gold Coast: Afram Plains, *W. H. Johnson*, 851; Aburi, *Anderson.*

Flowered at Kew in April, 1910, the plant having been sent from Aburi by Mr. J. Anderson. The sepals and petals are very pale greenish or sulphur yellow, and the lip white with 5 to 7 verrucose light purple keels on the disc.

345. **Lissochilus Johnsoni**, *Rolfe*; a *L. Andersoni*, Rolfe, labello latiore et disco 9-carinato differt.

Rhizoma crassum. *Folia* non vidi. *Scapi* erecti, 45-70 cm. alti, basi vaginis paucis lanceolatis obtecti; racemi laxi, 7–9-flori. *Bracteae* lineari-subulatae, acuminatae, 1–1·5 cm. longae. *Pedicelli* 1·5–2 cm. longi. *Flores* 2–2·3 cm. longi, "albi." *Sepala* subpatentia, lineari-lanceolata, acuminata, 2–2·5 cm. longa. *Petala* erecta, parallella, elliptico-oblonga, subobtusa, 2 cm. longa. *Labellum* late ellipticum, subtrilobum; 2 cm. longum, 1·3 cm. latum; lobi laterales rotundati, breves; lobus intermedius orbicularis, subundulatus, 1·3 cm. latus; discus medio fere ad apicem carinis 9 paullo verrucosis instructus; saccus conicus, obtusus, 6 mm. longus. *Columna* clavata, 1·5 cm. longa; anthera subapiculata.

Tropical Africa. Gold Coast: Accra Plains, *W. H. Johnson*, 854.

346. **Lycaste peruviana**, *Rolfe*; *L. Barringtonae*, Lindl., similis, sed pseudobulbo longiore et segmentis angustioribus differt.

Pseudobulbus oblongus, 6-angulus, 10 cm. longus, 3–5 cm. latus, 2-phyllus. *Folia* petiolata, elliptico-lanceolata, abrupte acuminata, plicata, prominenter 3-nervia, paullo undulata, circiter 23 cm. longa, 7 cm. lata. *Scapus* erectus, 14 cm. longus, vaginis angustis 2 obtectis. *Bractea* oblongo-lanceolata, subacuta, 1·5 cm. longa. *Sepala* oblongo-lanceolata, subacuta; lateralia deflexa, 4–4·5 cm. longa. *Petala* oblongo-lanceolata, subacuta, 3·5 cm. longa. *Labellum* 3-lobum, 2·5 cm. longum; lobi laterales angusti, obtusi vel subtruncati; intermedius ovato-oblongus, subacutus, fimbriatus, basi subconcavus; discus convexus; callus carnosus, 5-carinatus, apice elevatus, obovatus, crenulatus, subconcavus. *Columna* clavata, 1·3 cm. longa.

Peru. *Forget.*

Introduced by Messrs. Sander & Sons, St. Albans, with whom it flowered in May, 1910. The sepals and petals are light tawny brown, becoming paler at the base, and the lip is nearly white.

347. **Anguloa Cliftoni**, *Rolfe*; ab omnibus speciebus hujus generis labello unguiculato profunde trilobo et medio saccato differt.

Planta non visa (habitu generis). *Pedunculi* erecti, crassi, 16 cm. alti, basi vaginis spathaceis subimbricatis obtecti. *Bracteae* elliptico-lanceolatae, acutae, concavae, 5–6 cm. longae. *Flores* magni, subglobosi. *Sepalum* posticum elliptico-oblongum, subobtusum, incurvum et valde concavum, circiter 10 cm. longum, 5 cm. latum; sepala lateralia orbiculari-elliptica, concava, apice angustata et falcato-incurva, subobtusa, 7·5 cm. longa, 4 cm. lata, basi breviter connata et pedi columnae adnata. *Petala* orbiculari-ovata, valde concava, apice angustata, subobtusa, 7·5 cm. longa, 4·5 cm. lata. *Labellum* unguiculatum, circiter 4 cm. longum; unguis ligulatus, 1 cm. longus; limbus trilobus, basi saccatus; saccus 2 cm. latus; lobi laterales falcato-incurvi, oblongi, breves, obtusi, circiter 8 mm. longi; lobus intermedius late unguiculatus; unguis 8 mm. longus, basi callo

bilobo vel obcordato instructus ; limbus basi trulliformis vel triangularis, pubescens, apice recurvus, acuminatus. *Columna* crassissima, 3·5 cm. longa, subreflexa, prominenter gibbosa, deinde basi subito reflexa et facie concava, infra antheram constricta ; alae latae, subtruncatae ; stigma marginatum, valde concavum.

Colombia.

Introduced by Messrs. Charlesworth & Co., Hayward's Heath, and now in the collection of Mr. J. Talbot Clifton, Lytham Hall, Lanc., after whom it is named. The sepals and petals are lemon-yellow, the latter with a dark lurid-purple base and many transverse lines and reticulations above ; the lip is brownish-yellow, with a few brown spots on the limb of the front lobe. In the shape of the lip and column it is very different from any species previously known.

348. **Stanhopea elegantula**, *Rolfe* ; aff. *S. saccatae*, Batem., sed floribus minoribus, labelli cornubus brevioribus et epichilio subtruncato differt.

Pseudobulbi late ovoidei, irregulariter sulcati, circiter 5 cm. longi. *Folia* petiolata, elliptico-oblonga, subacuta, paullo undulata, prominenter 5-nervia ; 20–25 cm. longa, 5–7 cm. lata ; petioli 4–7 cm. longi. *Scapi* penduli, circiter 5 cm. longi, vaginis ovatis concavis subimbricatis obtecti, 2-flori. *Bracteae* ovatae, subacutae, concavae, 2·5–3 cm. longae. *Pedicelli* crassiusculi, 7–8 cm. longi. *Sepala* reflexa, concava ; posticum elliptico-oblongum, apiculatum, 4 cm. longum, 2·5 cm. latum ; lateralia suboblique ovata, apiculata, 4·5 cm. longa, 3 cm. lata. *Petala* reflexa, oblonga, obtusa, subconvexa, 3·5 cm. longa, 1·8 cm. lata. *Labelli* hypochilium profunde globoso-saccatum, 1·5 cm. longum, ore constricto et ad latera carina acuta instructo, intus radiatim glanduloso-lamelloso ; mesochilium latum, breve, apice brevissime 3-lobum, lateribus cornubus falcato-oblongis 1·3 cm. longis instructis ; epichilium late obovatum, truncatum, 1·5 cm. longum. *Columna* incurva, 3 cm. longa, alis angustis.

Habitat unknown.

Received with a small collection of miscellaneous Orchids from Mrs. Birdwood, Dalkeith House, Twickenham, in 1907, and flowered at Kew in April, 1910. The flowers are primrose-yellow, with the base of the petals and hypochile of the lip orange, sparsely dotted with brown.

349. **Listrostachys imbricata**, *Rolfe* ; affinis *L. Zenkeri*, Kränzl., sed foliis brevioribus, sepalis petalisque subsimilibus et acutis, et labelli calcare limbo breviore differt.

Planta pusilla, caule brevissimo. *Folia* ensiformia, oblonga, obtusa, carnosa, rigida, 1–2·5 cm. longa, 5–6 mm. lata. *Scapi* suberecti, 3 cm. longi, basi vaginis distichis numerosis ovatis acutis imbricatis obtecti ; spicae densae circiter 7-florae. *Bracteae* ovatae, acutae, membranaceae, concavae, 3–4 mm. longae. *Pedicelli* brevissimi. *Flores* albi, parvi, basi bracteis inclusi. *Sepala* et *petala* subconniventia, linearia, acuta, subsimilia, circiter 4 mm. longa, apice paullo recurva. *Labellum* subulato-oblongum, subacutum, circiter 3 cm. longum, apice subrecurvum, basi latius et concavum ; calcar subinflato-oblongum, obtusum, incurvum, 2 mm. longum.

Columna brevissima ; pollinia subglobosa ; stipites basi filiformes, apice dilatati et obovati ; glandula ovato-oblonga.

Tropical Africa. Gold Coast, *J. Anderson.*

Collected by Mr. J. Anderson, and sent to Kew in 1907. It flowered in the collection in February, 1910. It is a very small plant with equitant leaves, a short inflorescence clothed with imbricating bracts, and small white flowers.

350. **Bonatea sudanensis**, *Rolfe* ; affinis *B. Phillipsii*, Rolfe, caulis parte supera haud vaginata, sepalo postico incurvo venis reticulatis differt.

Folia radicalia non visa ; caulina sessilia, elliptico-oblonga, apiculata, 17–22 cm. longa, 3–3·5 cm. lata, supra ad vaginas haud reducta. *Racemi* 5-flori. *Bracteae* oblongo-lanceolatae, acuminatae, convolutae, 3 cm. longae, reticulato-venosae. *Pedicelli* 4–5 cm. longi. *Flores* magni. *Sepalum* posticum et petalorum lobi postici in galeam conniventes ; galea elliptico-lanceolata, acuminata, incurva, 2 cm. longa, venis reticulatis ; sepala lateralia petalorum lobis anticis labello et processibus stigmaticis elongatis supra medium adnata, circa 2·5 cm. longa, basi angusta, sursum dilatata, falcato-triangularia, deflexa, oblique apiculato-acuminata, reticulato-venosa. *Petala* profunde bipartita ; lobus posticus linearis, acutus, 2 cm. longus, lobus anticus elongato-linearis, 3 cm. longus. *Labellum* 4 cm. longum, tripartitum, lobis linearibus ; calcar incurvum, cylindricum, circiter 10 cm. longum. *Columna* 1 cm. longa, apiculata. *Rostellum* galeatum, apiculatum, apice incurvum, marginibus denticulatis, lobis lateralibus incurvis et in lobos 2 laterales longissimos rectos ascendentes productis. *Pollinia* lineari-oblonga, basi in caudiculas longissimas extensa. *Stigmata* spathulata, circiter 2·3 cm. longa.

Sudan. Erkowit, *F. S. Sillitoe*, 1464.

XXIV.—MISCELLANEOUS NOTES.

Mr. J. W. Anderson, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Curator in the Botanic Gardens, Singapore.

Rosa gigantea.—At last this Burmese rose has flowered at Kew, the large plant of it in the Himalayan section of the Temperate House having, during May, developed a few flowers on the young growths at the top. This plant has grown with exceptional vigour every year since it was planted at the foot of a pillar 15 years ago, and it has now a stem which measures 7 inches in circumference a few feet from the ground. For years there was a plant of it in the Succulent House (No. 5), a position chosen for it by the late Sir Henry Collett, but although it made a strong growth of stem and branches there it never flowered. There is a good figure of this rose in the *Botanical Magazine*, t. 7972 (1904), which was prepared from a plant grown in a greenhouse in the garden of the Duke of Northumberland, Albury Park, Guildford. The flowers are single, white, and 6 inches across.

Cycas Micholitzii.—A female specimen of this interesting cycad is now bearing a ring of 15 carpophylls, and can be seen in the Water Lily House, No. 10.

Some specimens of this species, collected by Mr. W. Micholitz in Annam, were presented to Kew by Messrs. Sander and Sons of St. Albans. During the spring of 1908 several of the plants produced male cones, and one of these formed the subject of a plate (t. 8242) in the *Botanical Magazine* for March, 1909. As no living carpophylls of this species have been seen in England before, and as they shew some features which have not hitherto been noticed, it may be of interest to give a brief description of the carpophylls produced at Kew. Of the 15 scales, which form a ring at the apex of the stem, three are small and barren, and the remainder, which are fertile, bear about 40 ovules. The fertile scales are from 3–4 inches long by about 1 inch broad, of a deep green colour, and covered on both sides with a fuscous tomentum, similar to that on the petioles. The pectinate fringe is composed of sharply pointed, dark-green teeth ½-inch long, glabrous, and with brown hard tips; a few of the teeth are forked. Some 10–15 teeth occur on each carpophyll. The seeds are glabrous, polished, and of a blackish-green colour. The species was first described in *Gard. Chron.*, 1905, vol. xxxviii., p. 142, figs. 48, 49.

Trees at Claremont.—It is a considerable distinction for a garden to possess the finest specimen in the kingdom of even one kind of tree, but Claremont has within its boundaries four or five for which we believe precedence may be claimed over all others of the same species in the British Isles. Writing in 1838, J. C. Loudon observed that Claremont at that time contained "a great many exotic trees, particularly cedars of large dimensions, very large cork oaks, tulip-trees and others of foreign origin" which had been planted by "Capability" Brown for the great Lord Clive about 1768. Many, no doubt, that were in their prime in Loudon's time have since disappeared. Claremont, as is generally known, is now the residence of H.R.H. the Duchess of Albany, and it is gratifying to know that Her Royal Highness takes a keen interest and pleasure in her trees and their preservation. Some valuable specimens have been promised for the new Museum of British Forestry now in course of formation at Kew.

Gymnocladus canadensis (Kentucky coffee tree) is represented by the finest specimen in the British Isles. It is over 60 feet high and its trunk is 7 feet in girth. *Sassafras officinale* with a trunk girthing 7 feet 2 inches (at one foot from the ground) and a height of about 50 feet, is the only fine specimen in the kingdom. *Magnolia macrophylla*, whose extraordinary leaves are often 2 to 2½ feet long and 9 or 10 inches wide, is 40 to 45 feet high and the trunk 2 feet 11 inches in girth. This tree is exceedingly rare in Britain and we know of no other that approaches these dimensions. A specimen of Redwood (*Sequoia sempervirens*) is in perfect health and shape. It is over 100 feet high and its trunk is 13 feet 7 inches in girth, clothed from base to summit with branches and forming a slender

pyramid. These four trees we believe are unrivalled in our islands, and scarcely inferior of its kind is an immense *Pterocarya caucasica*, equalling the splendid trees near Vienna. It branches very low down and the short trunk is over 19 feet in circumference; the head is about 50 feet high with a diameter of 100 feet. This tree flowers freely. According to Mr. Elwes it is surpassed by a tree at Melbury, Dorset. Of the cork oaks (*Quercus Suber*) mentioned by Loudon, one huge specimen at least remains; its trunk is 8 or 10 feet high and 13 feet 10 inches in girth, bearing a wide-spreading head of branches which is, unfortunately, badly damaged on the south-west side.

The following specimens whilst not the finest of their kind are certainly in the very first rank among British trees:—*Magnolia acuminata* 60 feet high, 5 feet 10 inches in girth. Deodar (*Cedrus Deodara*) 8 feet 5 inches in girth. Bishop's Pine (*Pinus muricata*) 80 feet high, 7 feet 10 inches in girth. *Cryptomeria japonica* 60 to 65 feet high, 8 feet in girth. *Cunninghamia sinensis* rarely seen in good form is here a shapely tree 35 feet high and 3 feet 10 inches in girth.

Of smaller growing species, there are three excellent specimens of the broad-leaved holly, *Ilex latifolia*, 16 feet high and bushy; *Buxus balearica* 18 feet high and 9 feet through; and the Nepal Juniper (*Juniperus recurva*) with an umbrella-like head of branches 22 feet across.

W. J. B.

Cupú-açú.—At a meeting of the Linnean Society on April 7th, "a new fruit obtained in London, presumably of *Theobroma grandiflorum*, Schum." was exhibited by the General Secretary on behalf of Mr. William P. D. Stebbing. *T. grandiflorum*, K. Schum. is a tall tree, native of the Amazons region. It is known in Brazil under the native name Cupú-açú (Cupú-assú), which is also applied to *T. bicolor*, Humb. et Bonpl. According to Prof. J. W. H. Trail, who was present at the meeting, Cupú-açú means "large Cupuá,"* Cupuá being an Indian name applied to species of *Theobroma*. Dr. J. Huber in his "Notes on the fruit-trees of Pará" (Bol. Mus. Paraense, vol. iv., 1904, p. 394) gives a short account of *T. grandiflorum*, of which the following is a rough translation:—

"The Cupuaçú (*Theobroma grandiflorum*, Schum.) is one of the most important fruit-trees of Pará. In the city of Belem one rarely finds a quarter in which this tree is not cultivated. It grows best in slightly shady places, inasmuch as it suffers from diseases and parasitic† plants when much exposed to the sun. The Cupuaçú is interesting from various points of view. Its flowers, which are not borne on the trunk but on the young branches, are the largest in the genus. Its fruits, which are undoubtedly the largest in the genus are globose or more frequently ellipsoid or cylindric, and

---

* The final a of Cupuá is dropped in combination with açú.

† Prof. Trail suggests that epiphytic plants are included under the term "plantas parasitas."

furnished with a hard woody shell. The pulp which surrounds the seeds is even more succulent and much more aromatic than in the cacao fruit, and furnishes excellent cooling drinks and preserves. The native country of the Cupuaçú is certainly the Amazons region and probably the Lower Amazons. I have found the tree in a wild state in the woods between Bragança and Ourem.

"Much more frequent in a wild state is an allied species, the Cupuahy (*Theobroma subincanum*, Mart.), the flowers and fruits of which are like those of the Cupuaçú in miniature. This species is very common in the woods of 'terra firme' in the Lower Amazons. . . . . Its fruits serve the same purposes as those of the Cupuaçú."

According to Prof. Trail, the name Cupuá-í means "small cupuá."

The Cupú-açú was noticed by Edwards (Voyage up the river Amazon, 1847, p. 66) between Pará and Vigia:—"We strolled into the woods, and returned with a number of the fruits called cupuassu. These are of the size and shape of a cocoa-nut in the husk, and within the shell is a fibrous, acid pulp, of which a delightful drink is made, much like lemonade. The producing tree is common in the forest, and of great size and beauty."

Bates noticed the Cupuá-í and other species of *Theobroma* near Santarem (The Naturalist on the river Amazons, 1863, vol. ii, p. 49):—"I was much struck with the variety of trees with large and diversely-shaped fruits growing out of the trunk and branches, some within a few inches of the ground like the cacao. Most of them are called by the natives Cupú, and the trees are of inconsiderable height. One of them called Cupú-aï bears a fruit of elliptical shape and of a dingy earthen colour six or seven inches long, the shell of which is woody and thin, and contains a small number of seeds loosely enveloped in a juicy pulp of very pleasant flavour. The fruits hang like clayey ants'-nests from the branches."

Santa-Anna Nery (The Land of the Amazons, 1901, p. 92) mentions "the Capú-assú, which serves to make jams, chocolate, and a liqueur."

Glaziou in his "Liste des plantes du Brésil central" (Bull. Soc. Bot. France, vol lii., 1905, Mém. 3, p. 56) records five species of *Theobroma* as cultivated at the Quinta de São Christovão, Rio-de-Janeiro, including *T. bicolor* (Cupuassú), *T. grandiflorum* (Cupuassú) and *T. subincanum* (Cupuai).

A note on the Cupu-assu appeared in Kew Bull. 1898, 104, in which it was stated that "there are fruits of *T. martiana* in the Kew Museum from R. Spruce, marked Cupu-assu, with the information that the pulp is made into a preserve." The fruits mentioned were collected by Hanbury, not Spruce, at Cametá in the province of Pará, and examination of the accompanying leaves has shown that the species is *T. grandiflorum*, K. Schum.

The genus *Theobroma* stands in need of revision, several of the species described by Martius and Bernoulli respectively being very imperfectly known. There appears to be some confusion as to the identity of *T. subincanum*, Mart., with *T. obovatum*, Bernoulli, on the one hand, and *T. ferrugineum*, Bernoulli, on the other. K. Schumann (Mart. Fl. Bras., vol. xii, part 3, p. 77) reduces *T. obovatum* to *T. subincanum*, and states that *T. ferrugineum*,

Bernoulli (as regards the specimens collected by Poeppig) is probably the same species. The type specimens of *T. ferrugineum*, however, which are preserved in the Kew herbarium, are undoubtedly specifically distinct from *T. obovatum*; but there are unfortunately no authentically named specimens of *T. subincanum* at Kew. It may be noted in this connection that Spruce's specimen of *T. ferrugineum* bears the same native name, "Cupuá-í," as is applied to *T. subincanum*, Mart.

T. A. S.

Botanical Magazine for May.—The plants figured are *Cymbidium insigne*, Rolfe, (t. 8312); *Primula Forrestii*, Balf. f., (t. 8313); *Nothofagus antarctica*, Oersted, var. *uliginosa*, Reiche, (t. 8314); *Cornus florida*, Linn., var. *rubra*, Hort. Parsons, (t. 8315); and *Acanthopanax Henryi*, Harms, (t. 8316).

The handsome *Cymbidium*, probably the most beautiful species of the genus, was first discovered by Mr. G. Bronckart in Annam in 1901. It was afterwards sent to Messrs. F. Sander & Sons by Mr. W. Micholitz, and was distributed by them under the name of *C. Sanderi*. The plant figured was presented to Kew by Messrs. Sander, and flowered in March, 1909. The colour of the sepals and petals varies from white to rose; the pale rose lip is densely spotted with purple, and bears two yellow velvety thickened lines on the villous disk. *Primula Forrestii* has been introduced to cultivation from Western China by Messrs. Bees, Ltd., through their collector Mr. G. Forrest. The plant is densely covered with glandular hairs, and the scape bearing an umbel of sulphur-yellow flowers with a deep orange eye sometimes reaches a height of 3 feet, but in the plant figured, of which the material was supplied by Messrs. Bees, Ltd., it was only 3 to 9 inches high. The *Nothofagus* is better known under the name of *Fagus*. The genus embraces 17 species, all of which are confined to the southern hemisphere, chiefly to Temperate South America and New Zealand. *N. antarctica* is distributed from lat. 38° in Chile to Tierra del Fuego, where, as in Patagonia, it is one of the dominant trees. The variety *uliginosa* is known in Chile as "Niere." The Kew plants which supplied the material for the figure were raised from seeds received from Mr. Elwes, who collected them near Lake Meliquina. *Cornus florida*, var. *rubra* has been illustrated from a specimen sent to Kew by Mr. B. E. C. Chambers, of Grayswood Hill, Haslemere. The large showy bracts are rosy red. *Acanthopanax Henryi* is a hardy shrub, with usually 5-foliolate leaves and heads of flowers and fruits closely resembling those of the ivy. It is a native of Central China, and has been introduced by Messrs. James Veitch & Sons. The bark of the root is used in China as a drug.

Botanical Magazine for June.—The plants figured are: *Agave Franzosini*, Nissen (t. 8317); *Fouquieria splendens*, Engelm. (t. 8318); *Kalmia cuneata*, Michx. (t. 8319); *Scutellaria violacea*, Heyne (t. 8320); and *Cirropetalum biflorum*, J. J. Smith (t. 8321).

Agave Franzosini is a remarkably fine species which has been figured from material sent to Kew from the late Sir Thomas Hanbury's interesting garden at La Mortola, where it has been in

cultivation since 1878. Previous to that year the species had been introduced into the garden of Mr. Francesco Franzosini at Intra on Lago Maggiore. It is a native of Mexico or Central America. The inflorescence—a panicle which has a diameter of about 10 feet—reaches a height of almost 40 feet. *Fouquieria* is a genus of considerable taxonomic interest and so singular in the structure of its flowers that the opinions of various botanists have differed very widely as to its proper systematic position, and accordingly it has been placed in several distinct natural orders.

Fouquieria was originally described by Bonpland and Kunth in 1823. The authors, after comparing it with genera belonging to five or six widely different orders, suggested that it might represent a new natural order coming in between *Portulacaceae* and *Crassulaceae*. Five years later A. P. De Candolle taking up their suggestion based upon the genus the new order of *Fouquieraceae*, placing it next to *Portulacaceae*, but pointing out at the same time that in the flower *Fouquieria* approached *Crassulaceae*, and in the fruit *Turneraceae* and *Loasaceae*. Bentham and Hooker in their Genera Plantarum reduced the *Fouquieraceae* to a tribe of *Tamaricaceae*. The same position was assigned to it by Niedenzu in Engler and Prantl's Natürliche Pflarzenfamilien, but later on Engler restored the natural order of *Fouquieraceae*, placing it next to *Tamaricaceae*. Van Tieghem, on the other hand, after examining their anatomical and morphological structure, came to the conclusion that the order should stand by the side of *Styraceae* and *Diospyraceae*. Finally, Nash, who recently monographed the order, thought it was much more closely allied to *Polemoniaceae* than to *Tamaricaceae*. The reasons given by the authors for assigning this or that position in the system rest either on superficial resemblances or on purely theoretical considerations of the value of certain characters, and the fact remains undisputed that the family occupies an isolated position without any very clear indication of relationship among the *Choripetalae*, and still less so among the *Gamopetalae*. *F. splendens* is a native of Northern Mexico and the South-Western United States. The plant—a spiny shrub reaching a height of 20 feet—has flowered in the Royal Botanic Garden, Glasnevin, whence material for the figure was sent by Mr. F. W. Moore. *Kalmia cuneata* comes from Carolina, and like other species of the genus it is a beautiful shrub. The plant figured was raised from seed presented by Professor Sargent of the Arnold Arboretum in 1904. *Scutellaria violacea* is a somewhat variable plant, native of India and Ceylon, producing elongated racemes of violet flowers, blotched with white on the lower lip. It was introduced to Kew by means of seeds received in 1900 from the Botanic Garden at Hakgala, Ceylon. The *Cirrhopetalum* is well characterised by its constantly 2-flowered scapes. Its flowers are large and showy, densely purple-dotted. The species is a native of the mountains of Java, and the specimen figured is one that was presented to Kew in 1908 by the Hon. W. Rothschild, of Tring.

The Grain Tree.—An enquiry has recently been received at Kew from a correspondent as to the identity of the Grain tree, which occasionally figures as a bearing in heraldic devices. Three sprigs

of this tree forms the crest of the Worshipful Company of Dyers, the description of the crest being—

"On a wreath of the colours, three sprigs of the grain tree, erect vert, fructed gules" :—that is to say, a plant with green leaves and red berries.

Application was therefore made to the Dyers' Company for information, but the Clerk informed us that nothing could be found in the records of the Company which would throw any light on the identity of the tree ; he added that in the Coat of Arms the three sprigs look exactly like Holly.

As the Holly tree appeared to have no logical connection with the arts of dyeing, some other explanation was looked for and the connection of the word 'grain' with the Cochineal insect gave the clue to the true nature of the grain tree.

The arms of the Dyers' Company were, however, granted in the XVth Century, probably between 1420–1450, so that it is clear that the Mexican Cochineal (discovered in 1518), could not be concerned, and that the grain tree is not an *Opuntia*.

The word 'grain' appears to have become associated with the Cochineal on its discovery on account of its having been used for the crimson dye material obtained from the 'Kermes' or *Coccus Ilicis*, which was well known in Europe from very early times. Pomet in his "History of Druggs," ed. 2. London, 1725, p. 15, pl. 8, fig. 36, describes "the scarlet grain or Alkermes" as follows :—

"The scarlet grain, which the *Latins* call *Grana Tinctorum*, the *Greeks*, *Coccus Infectorius*, and the Arabs, *Kermen* or *Kermes*, is the seed, or rather excrement, of a little shrub whose leaves are prickly, almost like those of Holy-oak. They are found in great quantities in *Portugal*, *Spain*, *Provence*, and *Languedoc*."

He points out that when the seed grows old it engenders an insect which will eat it up . . . . and it loses all its virtue.

In the account of the Cochineal or Cochenille, the grain is spoken of as the seed of the plant, "though some people affirm the Cochenille is a little animal or insect."

The origin of the term 'grain' in the case of the Kermes dye, is thus due to the ancient belief that the Kermes was really the seed of the tree and not on account of the granular appearance of the dried insect as is sometimes stated. The word 'ingrain' is connected with this derivation and refers originally to the 'fastness' of the dye obtained from this source. Thus Olivia, in "Twelfth Night," I. v. 255, "'Tis in grain, sir ; 'twill endure wind and weather."*

Grains of Cochineal are still spoken of in the trade, and owing to the greater cheapness of the Cochineal dye, the ancient and probably faster dye from the 'Kermes' has fallen into disuse.

The 'little shrub,' the host of the scarlet grain, is thus *Quercus coccifera* or Kermes Oak and is the grain tree of Heraldry. That it should have been confused with the Holly is not altogether surprising since the prickly leaves of this oak with the berry-like Kermes certainly suggest that plant. In Hayne's "Gewachse," Berlin, 1833, Bd. xii., Pl. 44, an interesting account of the Kermes

* *See* also "Comedy of Errors," III., ii., 108.

Oak is given, and there is a figure of a branch of the oak with the red berry-like "Kermes-schildläusen." According to Hayne, the insect nature of the berries was demonstrated as early as 1530, but later this was disbelieved and their vegetable origin was asserted. He adds that the insect is now known as *Coccus Ilicis* of Fabricius or *Coccus quercus cocciferae* of Nees v. Essenbeck.

Eastlake, in his "Materials for a history of Oil Painting," Vol. I., 1847, pp. 115, 116, gives some interesting information on the subject. "Chaucer in the 'Nonnes Preestes Tale' alludes to it [grain dye] thus

> "He looketh as a sparhauk with his eyen
> Him needeth not his colour for to dien
> With brazil, ne with grain of Portingale."

"The insect called Kermes by the Moors furnished the colour and name of crimson (kermesius, cremesius); sometimes called grain from the prepared material.

"The grain of Portugal was celebrated from the time of Pliny to that of Chaucer.

> "Granum . . . circa Emeritan Lusitaniae in maxima laude est.—L. ix. c. 65."

"The word Vermiculus, the older form of vermillion, also refers to this insect in the earlier treatises."

Loudon in Vol. III. of his "Arboretum et Fruticetum Britannicum," pp. 1909–1911 gives some additional information about the Kermes Oak.

"In its natural state," he records, "the kermes is of a shining appearance and of the colour of a plum with whitish bloom. In the state in which it is brought into the market it appears of a dull reddish-brown, which is not of course the colour of good Chermes but is imparted to it by steeping it in vinegar."

He adds further that "The merchants who produce the Kermes immediately steep them in vinegar, and then expose them to the action of heat sufficient to destroy any remaining vitality in the young: this process considerably alters the colour of the insect, and gives it that red hue for which it has been so long celebrated."

Quercus coccifera, according to Loudon, p. 1908, was cultivated in Britain previously to 1683, and "is well known as producing the Kermes, or scarlet grain, of commerce."

A further reference to 'grain' as a colour occurs in Shakespeare

> "I will discharge it in . . . . . your purple-in-grain beard . . ."
> —*Bottom*, in "Midsummer Night's Dream" I., ii., 97.

African Bass or Piassava (*Raphia vinifera*, Beauv.).—In the *Kew Bulletin* for 1891, pp. 1–5, is recorded the history of West African Bass fibre from the Colony of Lagos, and in the same publication in the year following, pp. 299–300, appeared a further note on the shipment of this fibre from Appam, a port on the Gold Coast. Several kinds of the fibre are now regularly exported from various ports in West Africa and quite recently some 3000 bundles of the fibre were submitted to auction in Liverpool.

In the Monthly Consular and Trade Reports of the United States of America, No. 352, 1910, p. 213, the following interesting

details are given of the industry in this product in Liberia :—

"Piassava was discovered about 1889 by J. H. Hugges, of Grand Bassa, Liberia, and was introduced to the commercial world in 1890. The value of this product was immediately appreciated in Europe, and for some years commanded the high price of $288 to $336 per ton. Just as the settlements in Montserrado County once flourished from the coffee industry, Grand Bassa, with its piassava, assumed the primacy in Liberian export trade and became the headquarters for the industry of the West Coast of Africa. The large profits attracted the aboriginal population by the thousands throughout the Republic, and by 1904 piassava had overtaken coffee and was the chief article of Liberian export. For a number of years this Republic was the only country from which piassava was secured. It proved, however, to be such a profitable industry that Liberia was brought into keen rivalry with the piassava from European dependencies in West Africa and fibre-producing countries of South America. This forced the price down at times to as low as $48 a ton.

"*Preparation of Piassava.*—Piassava fibre is secured from the Raphia palm (*Raphia vinifera*). Indigenous to the country, it grows in abundance in Grand Bassa, and is found in every county of the Republic. The fronds or branches of the tree are cut up into the desired lengths and placed in water—preferably running—to remain until all of the substance except the fibre has decayed. When sufficiently decayed, the branches are beaten until the fibre is free of all extraneous matter, then cleaned by being drawn through nails closely driven in a board rack. After being sun-dried the fibre is ready for market. The profits were so great and the preparation so simple that many who rushed into the industry adopted faulty methods, which left the fibre half cleaned. This materially assisted outside competition in bringing down the price of Liberian piassava. The merchants divide the products into the first and second grades.

"*The Export Trade—Commercial Uses.*—The rapid decline of coffee was attended by the equally rapid rise of piassava. However, poor methods of preparation and foreign competition soon materially reduced prices, and, quickly following in the wake of coffee, piassava receded from its primacy in Liberian trade. The local merchants now pay in cash 1½ to 2 cents per pound for the fibre and 2 to 2½ cents in goods, according to quality. The price in Liverpool this season is $62·40 to $84 per ton, against $57·60 to $97·20 at this time last year. These low prices are causing Liberians to turn to more lucrative productions. The amount of fibre exported in 1908 was as follows :—

Quarter.	Pounds.	Value.
		Dollars.
First	2,297,512	48,022
Second	1,843,319	52,698
Third	531,199	48,420
Fourth	2,697,832	54,168
Total	7,369,862	203,308

"The commercial use of piassava fibre is chiefly in making brushes and brooms, yet it may be used for baskets, in street-sweeping machines, for cordage, bottoms for chairs, etc. The *Raphia vinifera* produces an ivory nut with a hard outer covering from which Africans make rings and other articles for decoration and dress. Piassava is tied up at both ends and in bundles from 2 to 3 feet long, much like American wheat. It is remarkable how strong is this fibre and how well it resists decay and endures the wear and tear of the roughest work.

"In exchange for American cotton goods and provisions, thousands of pounds of this piassava may be had at almost every Liberian port. The aboriginal as well as the Americo-Liberians are anxious to secure American products, and for them they show a decided preference. In case American exporters seek to extend trade in this district consideration should be given to piassava fibre."

Under date March 8th, Messrs. J. H. Rayner & Co., Produce Brokers of Liverpool, in their weekly report, state, in reference to this fibre, that recent arrivals per "Fulani," amounting to 1500 bundles, were offered at public auction on the preceding Friday; there was very fair competition and the bulk sold at full prices as follows:—

	£	*s.*	*d.*		£	*s.*	*d.*	
Grand Bassa	18	10	0	to	21	15	0	per ton.
River Cess	21	5	0					„
Junk River	20	0	0	„	21	0	0	„

Sherbro and Gaboon sorts on private terms since the auction.

Specimens illustrating the economic uses of this Palm will be found in Case 51, Museum No. II.

J. M. H.

Algological Visit to Achill and Clare Island.—In April, 1909, Mr. Cotton, Assistant, Cryptogamic Department, was able to pay a visit to Achill and Clare Island. The report submitted by him is here reproduced.

On Wednesday, April 7th, I left London by the night mail and reached Achill at 1 p.m. the following day. I worked the sand-banks and channels left dry during the low spring tide that afternoon, and proceeded to Clare Island in the evening. On Clare Island various positions were selected for collecting purposes and a large number of specimens were gathered, laid out, and dried for the Herbarium. Special attention was paid to species and varieties of *Callithamnion*, *Polysiphonia* and *Ectocarpus* with a view to the systematic revision of these genera. Care was also given to the collection of certain microscopic algae which are poorly represented in the Herbarium.

Amongst the larger algae collected were several specimens of the Mediterranean *Codium elongatum*, only once previously found in the British Isles, and the very rare *Leathesia crispa*, which, except for specimens presented quite recently, was entirely unrepresented in the Herbarium; whilst amongst the microscopic algae obtained, several will almost certainly furnish the first British examples for Kew. The known distribution of other species was extended.

On Saturday, April 18th, I returned to the mainland, and from Achill visited, by cycle, various localities for collecting. Parts of Achill Sound, Bellacraghy Bay, and Mallaranny in Clew Bay provided interesting and very luxuriant specimens. A short time was also spent collecting fungi.

Both on Clare Island and on the mainland, considerable atttention was given to the distribution of the algae with regard to the exposure of the coast, nature of substratum, light, depth and salinity of water, and other points of biological importance.

A. D. C.

'Die-back' of Hevea brasiliensis.—An account of this disease is given in Circular No. 23, Royal Botanic Gardens, Ceylon, by Mr. T. Petch. When first observed it was essentially a disease attacking young trees from one to two years old. Recently, however, it has assumed a more serious aspect, attacking trees from nine to fourteen years old, and in some cases it has killed these with astonishing rapidity. The disease kills back the tree from the top, the leading shoot being attacked first at some distance below the apex. The place attacked becomes dark brown, and this discoloration gradually extends over the whole shoot, while the leaves fall off as the fungus reaches them. The brown patch is frequently rather soft, but hardens afterwards and turns grey. The fungus causing this disease forms its fruit just beneath the epidermis, which is raised in very minute swellings that burst at the top and liberate the spores, leaving minute holes which make the shoot rough. The fungus is called *Gloeosporium alborubrum*, Petch. If the dead top shoot is cut off, the tree sends up a new leader, and but little damage is done. If neglected, the "die-back" frequently continues down the stem until it reaches the root, and the tree is killed.

The disease is complicated by the attack of a second kind of fungus. After the death of the leading shoot, the second fungus—*Lasiodiplodia theobromae*, Griff. & Maubl. (= *Diplodia theobromae*, Petch, and *Diplodia cacaoicola*, Henn.), may enter the dead shoot, and grow downwards in the woody stem, gradually killing it down to the base. From the above account it will be seen that the disease is primarily due to the *Gloeosporium*, and completed by the *Lasiodiplodia*. The latter fungus can also live on dead leaves and dead stems of *Hevea*, hence promptitude in removing such is of primary importance, and the removal of dead branches should also be attended to. All diseased material should be promptly burned.

When branches are removed the wounded surface should be tarred to prevent the entrance of fungi. For some undetermined reason, the fungus does not attack the tapped surface.

G. M.